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ENVIRONMENTAL IMPACT STATEMENT

TRIMBLE COUNTY GENERATING STATION

Supporting Report

Volume II

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30308

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DRAFT ENVIRONMENTAL IMPACT STATEMENT
TRIMBLE COUNTY GENERATING PLANT
SUPPORTING REPORT, VOL. II

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6.0 ENVIRONMENTAL IMPACTS OF PROPOSED PROJECT

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LG&E proposes to construct a 2340 megawatt coal-fired steam electric generating station at Wises Landing, Kentucky, Ohio River mile 571. A 1000 acre site for structural and pond facilities is needed as are two ajacent ravines (1300 acres) for solid waste disposal. Associated transmission facilities are also proposed. Major Federal actions for the project are issuance of new source NPDES Permit from EPA and a section 10/404 Construction Permit from the Army Corps of Engineers. Air Quality and scrubber technology are the major issues. Aesthetic and secondary impacts to the river valley are also significant issues.

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6.0 ENVIRONMENTAL IMPACTS OF PROPOSED PROJECT

6.1 PRIMARY CONSTRUCTION IMPACTS

The discussion of primary construction impacts has been divided into two main sections: impacts from construction of the plant and impacts from construction of the transmission line. This has been done because of the preliminary nature of the Indiana transmission line study, which allows only generic impacts of transmission line construction to be addressed at this time. Measures to mitigate construction-related environmental impacts are addressed in Section 7.0 and are contained in the draft National Pollutant Discharge Elimination System (NPDES) permit for the project (Appendix T).

6.1.1 Atmosphere[a]

Climate

Construction operations associated with the proposed Trimble County Generating Plant should in no way alter the local climatological conditions.

Air Quality

The construction phase of the proposed project will span a period of approximately 14 years, during which time each of the four units will be brought on line. During this period, ambient air quality in the vicinity of the site will be modified to an extent dependent upon the nature of construction activities. Fugitive dust will be raised from untreated or unpaved road surfaces or unvegetated areas during dry, high wind speed conditions and/or with movement of heavy equipment.

Concentrations of nitrogen oxides, carbon monoxide, and hydrocarbons will increase due to engine exhaust from construction equipment and exhaust from automobiles used by the construction work force to travel to and from the site.

Fugitive dust is likely to be the most significant problem and will require the mitigative measures discussed in Section 7.0.

6.1.2 Land[a]

Geology

Construction of the proposed plant is not expected to have any significant impact on the geologic structure, stratigraphy, or lithology of the site.

The stratigraphic sequence in the recent alluvial terrace deposits in the flood plain area will experience partial disruption due to site excavation and earthwork operations associated with construction of the facility. The excavation and earthwork operations that will interrupt the natural stratigraphic sequence of these soil deposits will cause a permanent change to occur, although the long-term impact of this change will probably be positive. In accordance with the engineering aims of these earthwork operations, the recent alluvial deposits will experience a mechanical strengthening and material rearrangement that is intended to improve the support, containment and drainage features of the site.

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[a] Transmission line construction impacts are described in Section 6.1.5.

The geologic stability of the site is not affected by known active faults, local tectonic movements, or potential causes of ground subsidence such as mineral or fluid extraction from beneath the site. However, the river bluff on the east margin of the site is underlain by horizontally bedded strata composed of limestone and shale. Although the bedrock itself is not prone to slope failure, the thin mantle of clayey residual soil is probably in a natural state of quasi-equilibrium and may be prone to minor slope failure in response to some earthwork operations. The residual clay soils are believed to range in thickness from about 10 feet to a maximum of 20 feet, and lie on a slope that averages 1 vertical to 1-1/2 horizontal (Nieto, 1975).

Excavation operations at the foot of this bluff that may be required for relocation of access roads or clay borrow pits for impermeable pond liners may initiate shallow slump failure in these residual and colluvial soils. It is conceivable that such a failure, once initiated, could propagate uphill in such a manner that a significant portion of the bluff would be affected. Although minor slumping of the residual soils may be expected to occur infrequently regardless of plant construction activities, a detailed engineering study will be included with the design of excavations in the vicinity of the bluff area to forecast and minimize the possibility of initiating a major slope failure.

Seismicity

A site seismicity study was completed by the Applicant's design engineer in 1975 and rerun in 1977. The 1977 study is in Technical Appendix VII. The design earthquake on firm ground at the site, based on an earthquake with a 500-year return period, is estimated to have a Modified Mercalli intensity between VI and VII and a ground acceleration value of 3 percent of gravity. The proposed plant will be designed to withstand the loads associated with this ground acceleration.

Surficial Soils

The surficial soils (natural topsoil) will be permanently destroyed in portions of the property that are subjected to major construction activity. Topsoil in the major construction areas on the flood plain will have to be removed and relocated before earthwork operations begin. Some of the topsoil that will be removed from the flood plain area may be stockpiled and reused as a landscape dressing after the construction phase is completed. This will depend on the final design plans, which are incomplete at this time.

Areas where natural topsoil will be removed from the present plant environment are as follows:

Plant Area	Approximate Size (Acres)	Agricultural Soil Association	Mode of Destruction	Phase in Plant Life
Onsite disposal pond	180	Wheeling-Weinbach-Huntington	Removal	During construction
Power plant construction zone	38	"	"	"
Ancillary facilities and roadways	203	"	"	"
TOTAL	421			

The major impact of disturbing the surficial soil deposits is the permanent commitment of the land to uses other than agriculture. Removal of the Wheeling-Weinbach-Huntington soils constitutes a significant impact because these are productive cropland soils.

Terrestrial Flora and Fauna[a]

Flora

There will be several primary construction impacts on the flora of the Trimble County Generating Plant site. The following discussion presents these impacts in the descending order of acreage disturbed.

During the construction phase, vegetation will be lost from several of the local plant communities on the site and in the ravines. This loss will consist of the following approximate acreages:

1,164 acres - upland woods

372 acres - cultivated croplands

164 acres - pastureland

14 acres - bottomland woods

34 acres - riparian habitat

96 acres - miscellaneous communities, including field margins, forest edges, fence lines, pond margins, roadsides, and oldfields and other abandoned lands (including former homesites)

TOTAL 1,844 acres 2.9 square miles

---

[a] Transmission line construction impacts are described in Section 6.1.5.

This loss of cover vegetation is unavoidable and of major significance. The vegetation of the plant site will be removed gradually between 1978 and 1989; the majority of the vegetation will have been cleared by 1981. The ravine vegetation will be removed very gradually. The ravines will be filled one at a time. Further, the solidified sludge will be placed in terraces, starting at the back of each ravine. Vegetation will be removed only from an active disposal portion of the ravine. Removal will consist of clear-cutting trees and shrubs; other vegetation, as well as tree stumps, will not be removed.

The sawtimber hardwoods of the upland woods have been harvested. This action occurred over a period of many years. The remaining timber is primarily of the poletimber and sapling size classes and has commercial value as rough construction lumber, pulpwood, and fuel.

The cultivated croplands (400 acres[a]) are primarily used to grow livestock feed and are in a 3-year corn/2-year soybean rotational cycle. Loss of these croplands constitutes a major adverse impact from both an economic and ecological standpoint. The following values are conservatively estimated to represent the agricultural "worth" of this land over the assumed 36-year life of the facility.

Crop	Average Yield	Rotation Pattern (Years)	Years
Corn	80 bushels/acre	3	22
Soybeans	60 bushels/acre	2	14
		Total Plant Life	36

Calculations

(Latest commodity values available from the Queen City Grain Company)

Corn $2.45/bushel; soybeans $6.45/bushel

Corn

80 bushels/acre x 400 acres = 32,000 bushels/400 acres

32,000 bushels x $2.45 = $78,400/year

$78,400 x 22 years = $1,724,800 corn $ yield

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[a] There were approximately 400 acres under cultivation when the site was purchased by the Applicant in 1973.

Soybeans

60 bushels/acre x 400 acres = 24,000 bushels/400 acres

24,000 bushels x $6.45 = $154,800/year

$154,800 x 14 years = $2,167,200 soybean $ yield

Total dollar value of agricultural land over 36 years, excluding actual property values, etc. = $3,892,000

In addition to its economic value, this agricultural land provides a major habitat for wildlife species that utilize cropland for forage and limited cover requirements.

The bottomland woods vegetation type is located along Corn Creek, the oxbow area, and a small area near the southern end of the site (see Section 5.2.4). This vegetation type is a valuable food source to wildlife of the area; particularly valuable overstory forage species are the following: black walnut, black locust, yellow buckeye, oak, hickory, papaw, red mulberry. Although the bottomland woods constitute only 4 percent of the total acreage required for the proposed project, its importance from a wildlife use standpoint (see Section 5.2.4) makes this vegetation type the most valuable on the site. The proposed project will destroy approximately 14 acres (17 percent) of the bottomland woods on the site.

The other plant communities of the site provide wildlife species with forage, cover, and concealment.

Removal of vegetation from the site will result in alteration and interruption in the existing successional trends within each of the vegetation communities. Further, loss of vegetation will bring about removal of forage and cover species, which are an important wildlife component of the area.

Vegetation removal during construction will result in erosion, sedimentation, and organic and inorganic nutrient removal. Several ameliorative measures to minimize this impact are discussed in Section 7.0. If the measures are used, the magnitude of this impact will be reduced.

No rare and/or endangered plant species are known to exist on the plant site.

Fauna

Most of the primary construction impacts affecting the terrestrial fauna of the Trimble County Generating Plant site are related to removal of vegetation. Construction of the facility will result in the permanent loss of approximately 1,850 acres of wildlife habitat. Specific types and acreages of habitat lost are presented in the previous section. The loss of habitat (i.e., living space, food, cover, nesting, and breeding areas) will directly affect those wildlife species that either reside permanently in the construction and disposal areas or those that satisfy a specific life requirement there (e.g., enter the area to feed or stop to rest during migration). Other primary impacts resulting from completion of the proposed project include reduction and possible elimination of a well-established stopover point for migratory waterfowl; loss of some nonmobile species of wildlife; loss of wildlife resulting from increased traffic in the plant site area; forced emigration of wildlife; increased noise and dust levels and human disturbance; creation of edge habitat; and alteration of the food web.

Habitat loss will affect a diverse population of wildlife now inhabiting the plant site area. Many species of birds (Appendices M and N), mammals (Table 5.2.4-12 and Figure 5.2.4-7), and amphibians and reptiles (Table 5.2.4-14) will be adversely affected, including several species of economic and recreational importance--namely waterfowl, furbearers, and small and large game. In addition, elimination of the river bank constitutes loss of a limited habitat type (breeding) for bank swallows, which have formed a nesting colony there.

The use of the site for a power plant will diminish and possibly eliminate a well-established migratory stopover point for waterfowl. As noted in Section 5.2.4, migratory waterfowl use the Corn Creek/oxbow area and its surrounding agricultural lands during periods (primarily the early spring) when the creek and the oxbow are flooded. Waterfowl are important from an aesthetic as well as recreational and economic standpoint.

Animal losses associated with construction and waste disposal will directly affect the less mobile species of wildlife such as small rodents, amphibians, and reptiles. If the construction periods coincide with nesting and the emergence of the young of species residing on the site, some of the population will be lost.

Additional animal losses (road kills) will result from increased road traffic in the plant site area. Species most likely to be affected include deer, rabbits, opossums, skunks, and certain amphibians and reptiles.

Many species of wildlife will be forced to emigrate to adjacent lands. Forced movement into unfamiliar areas will subject animals to increased road traffic, predation, and competition for resources with animal populations already in these adjacent areas. An abundant population of raccoons could be forced to leave the present oxbow area, depending on their reaction to construction of the plant on surrounding areas.

Increased dust concentrations, noise levels, and human disturbance resulting from construction and waste disposal activities will have some effect on wildlife. These disturbances will result primarily in animal avoidance of activity areas. Species of wildlife most sensitive to these impacts that are presently inhabiting areas to be affected will be forced to move into neighboring habitats.

Alteration of the food web will occur as vegetation is removed from the site. The acres of cropland and bottomland vegetation provide either part or all of the food source for a variety of wildlife species including small rodents, cottontail rabbits, opossums, skunks, raccoons, foxes, deer, doves, quails, and many other species of birds. Food is the critical resource as far as population density is concerned for the great majority of many species of animals (Wynne-Edwards, 1962). The loss of this resource will require animals to search elsewhere for food, placing an increased demand on resources in already occupied habitats. Further, animals may be forced to eat less suitable or "starvation" foods. The alteration of the food web will contribute to the direct or indirect reduction of animal numbers in the project area.

No rare and/or endangered wildlife species were encountered during the baseline studies.

6.1.3 Water[a]

Water Quantity

Surface Water

Construction activities at the Trimble County plant site will not have any effect on the quantity of water in the Ohio River. Low flow in McAlpine Pool is controlled by dams upstream and downstream of the site.

Construction activities will have some effect on the amount of runoff from the site. The stormwater runoff system will collect, contain, and treat most site runoff before discharging it to the Ohio River. Some of the runoff collected in the retention basin will be lost to evaporation. Also, water that collects in the onsite disposal pond will be used for plant makeup water.

The loss of runoff that will result from the plant construction runoff collection system will not cause a major impact on the Ohio River.

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[a] Tranmission line construction impacts are described in Section 6.1.5.

Ground Water

Construction of the power generating units, cooling towers, onsite disposal pond, and other elements of the plant will reduce ground water recharge from precipitation because of increased surface runoff and decreased filtration. However, the net effect of plant construction and operation on ground water recharge is considered to be insignificant because the volume of recharge attributed to surface infiltration is small relative to recharge from the Ohio River.

Water Quality

Stormwater runoff from portions of the construction site will be ponded and treated as required in order to comply with NPDES permit for the plant (Appendix T). The retention pond is described in Section 4.3.3.

Once the suspended sediment has settled out in the retention pond and the total suspended solids concentration is 50 mg/1[a] or less, the water will be treated, if necessary, to remove oil and grease and maintain the pH level between 6 and 9. Thus, potential impacts on the Ohio River from runoff discharge will be substantially reduced.

Runoff from other construction areas, such as the rerouted County Road 1488 and the exterior slopes of the onsite disposal pond, will be diverted directly into Corn or Barebone Creeks. Measures to mitigate the sediment load carried by this runoff are described in Section 7.0.

No appreciable degradation of water quality in Corn Creek (before or after rerouting) or Barebone Creek will result from stormwater runoff if care is taken to reduce erosion on the site.

In the early phases of construction, chemical toilets will be used exclusively. When the sediment retention basin is completed, a sanitary treatment system will be added and the wastewater discharged to the sediment retention basin. Treatment system sludge will be hauled offsite by a licensed scavenger. After the bottom ash storage pond is constructed, sanitary wastewater and sludge will be discharged to the ash pond.

Equipment washwaters (containing sodium triphosphate) and associated cleansers and contaminants will also be discharged into the onsite disposal pond.

The previously diverted, lower 1,800 linear feet of Corn Creek will be relocated to the north of the proposed onsite disposal pond dike. This activity will temporarily increase turbidity in Corn Creek and locally in the Ohio River. This turbidity will be like that created during the regular dredging operations (for sand and gravel or channel maintenance) in the river. The stream flow velocity and sedimentation rate may also change, resulting in changed sediment loads delivered to the Ohio River.

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[a] This standard has been recently set aside by the U.S. Court of Appeals.

A less observable temporary effect from the rerouting of Corn Creek will be the probable nutrient enrichment of the new backwater area as nutrients enter the water from the dredged streambed soils.

Construction of docking facilities and intake and discharge structures will cause temporary changes in the quality of the Ohio River in the vicinity of the construction. The docking and unloading facilities and the intake and discharge structures will parallel approximately 6,000 feet of undeveloped Ohio River shoreline. The movement of earth and equipment during construction of these facilities will temporarily increase suspended solids and turbidity in nearshore waters adjacent to and immediately downstream of the site. These activities are scheduled to take place from September 1979 to October 1981 on an intermittent basis. Disturbances from these activities will be short term, and adverse effects should be predominantly local. The effects of these activities would be overshadowed if one of the sand and gravel dredges were working in this reach of the river.

An increase in the amount of tow traffic in McAlpine Pool will occur when barge loads of equipment and bulk materials are delivered to the site during construction. These tows will cause additional wave action along the shoreline and additional turbidity in the vicinity of the unloading docks.

The bulk materials delivered to the site during construction include cement, sand, gravel, reactant, coal, and fuel oil. Only coal and fuel oil would have temporary adverse effects on water quality if there were an accidental spill during site construction. Generally, a spill would occur only from docking and unloading activities; the amounts spilled would be small.

Water Uses

During construction of the plant, ground water will be used for a concrete batching plant, drinking, sanitary facilities, equipment washing, and dust control. On the basis of a maximum pour of 1,600 cubic yards of concrete per day, and sanitary facilities for 400 persons, the maximum quantity of ground water expected to be removed from the glacial outwash aquifer during construction will be approximately 100,000 gallons per day. The average use during construction will be approximately 44,000 gallons per day.

Aquatic Biota

The main impact to aquatic biota resulting from construction of the docking and unloading facilities and the intake and discharge structures will be the increase in sedimentation, turbidity, and suspended solids and the resuspension of bottom sediments. This will also be the main impact from the increased barge traffic associated with the construction of the plant.

High turbidity and suspended solids levels adversely affect some fishes by interfering with gill "breathing" and with sensory receptors used to locate food or prey. Although this area of the river does not provide fishes with a high-quality spawning area, eggs that are spawned near the site could be silted over as a result of the increase in suspended sediments.

Resuspension of bottom sediments and the introduction of new sediment (soils) will increase the levels of dissolved nutrients (and possibly toxicants) which are released from bottom sediments and the sediments introduced into the river from the site. Further, additional suspended solids and resuspended sediments (including particulate organic matter stirred up from the river bottom) can affect phytoplankton (floating plants), periphyton, and shallow-water aquatic plants by clouding the water to such a degree that the amount of sunlight reaching these organisms is substantially reduced. When this occurs, photosynthesis is reduced or prevented, and many of the light-dependent organisms die.

During construction, mobile fish species will tend to avoid areas of disturbance. Increased turbidity and sedimentation from construction activities will prompt more mobile benthic species to move or drift out of the affected area. However, less mobile species will perish with increased turbidity and sedimentation.

Because the Kentucky side of the Ohio River is dominated by pollution-tolerant organisms, and because their densities are already low, the impact of construction is not expected to be major. Additionally, the impacts will be temporary because these organisms, as well as the fishes, will reestablish themselves in the area shortly after construction activities have ceased.

Increased nearshore barge traffic during delivery of construction material and equipment to the site may alter the behavior of fishes and other aquatic organisms that use the shoreline for feeding, breeding, or dwelling. As with turbidity from construction activities, higher turbidities caused by increased barge traffic could interfere with sight feeders or cause gill damage through the abrasive action of the suspended sediments.

Any increases in turbidity resulting from the project are likely to work their primary influence by reducing the food and cover available for developing young-of-the-year fishes during the mid-and late summer season and not by directly increasing the mortality rates of either eggs or young fishes. Gammon (1970) found effects of this nature in a stream receiving crushed limestone wastes.

Additional temporary sedimentation and turbidity will be contributed by the onsite disposal pond and retention basin construction and the relocation of the lower portion of the Corn Creek Channel.

Benthic and periphyton communities would be adversely affected should any material spillage occur during barge docking and unloading activities. They will also be affected by boat wave action and associated turbidity in the shallows at the shoreline. However, as indicated, existing benthos and periphyton at the site are already low in numbers and diversity. Furthermore, recolonization is normally rapid.

Conditions of high turbidity regularly and normally occur during periods of high precipitation, overland runoff, and stream discharge. Erosion of agricultural land is the principal contributor. Such conditions have become so prevalent that they are regularly viewed as periodic natural features of river and stream ecology in agricultural areas. Thus, turbidity in the Ohio River due to project construction will be temporary and localized compared to that occurring as a periodic background condition.

The placement of the docking and unloading facilities and the intake and discharge structures will eliminate some aquatic habitat along the shoreline. The structures themselves will, however, provide new substrate for colonization by periphyton, insects, and mullusks.

The relocated portion of Corn Creek will require time to redevelop a stable aquatic community structure. Elimination of the trees (which currently provide the creek with shade and a source of insects and organic matter) that line the banks of the creek will increase the temperature of the water and diminish the value of the channel as a habitat for aquatic organisms, particularly fishes.

Initially, the new channel will provide little to support aquatic biota. Benthos will drift into the area, but until conditions stabilize and become more favorable, they will remain there only temporarily. Fishes would also occupy the area only on a temporary basis until food organisms become prevalent. Initially, the area will be dominated by organisms that rely on planktonic or sestonic foods. As the organic matter on the stream bottom increases with time, detritus feeders will become more prevalent.

In the lower reaches of the new stream channel, organic enrichment will take place following flooding conditions. Speciation and dominating species types will be constantly changing until the rechannelized portion of the stream essentially reaches equilibrium with regard to flow regimes, substrata, water quality, and shoreline vegetation. These conditions will dictate what populations will finally develop in this section of the stream.

No species listed by Kentucky or the federal government as rare and/or endangered were collected during the survey conducted by the University of Louisville.

6.1.4 People[a]

Construction of the proposed Trimble County Generating Plant will commence in 1978 and terminate in 1991, approximately 2 years after Unit 4 is brought on line. As indicated in Table 6.1.4-1, the peak construction period will be 1983, when 695 construction personnel will be employed at the site. Only at the beginning (1978 and 1979) and end (1990 and 1991) of the construction period will there be relatively few construction personnel at the site.

During the construction period, there will be significant activity at the site and in surrounding areas, accompanied by increased vehicular and barge traffic, noise, dust, increased demand for public services, and a possible temporary increase in the local population. This increase in population could include the addition of some minority and ethnic personnel. While these results are likely to constitute adverse impacts, benefits, in the form of new employment opportunities and a new source of income, will also accrue to the county.

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[a] Transmission line construction impacts are discussed in Section 6.1.5.

TABLE 6.1.4-1

ESTIMATED CONSTRUCTION PERSONNEL
TRIMBLE COUNTY GENERATING PLANT

Year	County Population[a]	Peak Period[b] Construction Personnel	Percent of Trimble County Population	Estimated Gross Yearly Payroll[d] ($000)
1974	5,550[c]	0	0	0
1977	5,650	0	0	0
1978	5,701	40	0.7	675.2
1979	5,752	180	3.1	3,205.4
1980	5,804	300	5.2	5,636.1
1981	5,856	440	7.5	8,720.8
1982	5,909	630	10.7	13,173.3
1983	5,962	695	11.7	15,331.7
1984	6,016	592	9.8	13,777.6
1985	6,070	632	10.4	15,517.5
1986	6,125	592	9.7	15,344.6
1987	6,180	632	10.2	17,271.3
1988	6,236	592	9.5	17,068.0
1989	6,292	632	10.0	19,223.5
1990	6,349	173	2.7	5,551.6
1991	6,406	60	0.9	2,031.3
			TOTAL	152,527.9

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[a] Assumes 0.9 percent annual rate of growth.

[b] From Table 4.3.1-2.

[c] U.S. Department of Commerce, 1975.

[d] Assumes base salary of $16,000 (1977 dollars) escalated at 5.5% per year.

In the following subsection, a description of the primary effects of plant construction is presented. A description of secondary effects is presented in Section 6.2.4. Before proceeding, it is necessary to define those areas that will be affected most significantly by construction of the plant.

While many of the adverse effects of construction will be focused on the plant site area and Trimble County, most of the beneficial effects will be experienced in the Metropolitan Louisville area, primarily because the majority of construction personnel will be obtained from this area. The proposed site is within commuting distance of Louisville, and there will not be a major relocation of construction workers to the project area. Also, because of the significantly greater availability of goods and services in the Louisville area, it is expected that most of the employees' wages will be spent there. For these reasons, Trimble County is defined as the "local" impact area and Metropolitan Louisville is defined as the "intermediate" impact area. While some effects will be experienced in a much broader "regional" area, most of the impacts will be experienced in the local and intermediate areas.

Effect of Plant Construction on Employment

As previously indicated, most of the construction labor force will be drawn from the Louisville area. In past projects, the Applicant has employed approximately 70 percent of the construction labor force through its Louisville Construction Department, with the remaining 30 percent coming from subcontractors on an as-needed basis. The majority of subcontractors are also drawn from the Louisville area, although, for this project, some may be obtained from Madison, Indiana and Cincinnati, Ohio. Some skilled and unskilled laborers may be hired from the local area; however, they will account for a relatively small percentage of the total labor force.

The need to draw construction laborers from outside the local area is reinforced because there are few construction personnel available in Trimble County and some of the adjacent rural counties. In 1974, there were approximately 2,232 people employed in Trimble County (Commonwealth of Kentucky, 1975). There were 14,269 persons employed in the nearby counties of Carroll, Henry, and Oldham. Assuming that construction personnel accounted for 5 percent of the labor force, then there were approximately 111 construction personnel in Trimble County in 1974. With a county unemployment rate of 2.5 percent, there would have been only three people available to work on the proposed project. There were approximately 25 to 30 unemployed construction workers in the four-county area during this period.

At the peak of construction, it is unlikely that more than 5 percent (35 personnel) of the labor force will relocate to Trimble County. This relatively small number of relocations reflects the brief time the majority of construction laborers will actually work at the site. It also reflects the short commuting distance between Louisville and the construction site, which negates the necessity to relocate. The majority of relocations will probably include construction supervisory and administrative personnel who will be assigned to the site during the peak construction years.

If it is assumed that each of the 35 relocating personnel brings a family (3.57 persons per family - the 1970 Kentucky average), then 125 persons will relocate to the county as a direct result of construction of the plant. This will be equivalent to 2 percent of the 1983 (peak construction period) projected county population of 5,962. This total increase will include 55 dependents, many of whom will be of school age, in addition to the workers' spouses.

Wages of Construction Personnel

Over $152 million in wages and salaries will be paid to construction personnel over the 14-year construction period. Of this total, an estimated $107 million will constitute disposable income, most of which will be spent in the Louisville area. These wages will result in a major benefit to the economy of the area in which they are spent. A schedule of estimated construction wages is presented in Table 6.1.4-1.

Effect of Plant Construction on Housing

As indicated, there will not be a significant relocation of construction personnel to the local area. However, some of the laborers who may have a particularly long (i.e., multi-year) involvement with the project may choose to relocate in the county. There are few vacant houses for sale or rent (University of Louisville, 1974), and a demand for housing could serve to stimulate new construction.

As previously indicated, it is unlikely that more than 35 personnel of the peak construction labor force will choose to relocate to the county. It is reasonable to expect that local housing contractors could accommodate the increased demand, particularly if this demand is spread over a period of several years. At present there are approximately 50 new housing starts per year in Trimble County, and most of these houses are constructed for existing county residents.

It is possible that some personnel may work at the site during the week and commute to their homes on the weekends. This would probably result in an influx of mobile homes into the county. Because there are no zoning laws or public sewerage facilities in Trimble County, this could result in a degradation of local aesthetics and possibly pose health problems. Early planning by county officials could serve to mitigate these potential problems.

Effect of Plant Construction on Roads

State Road (SR) 754 connects Wises Landing with Bedford, Kentucky. County Road (CR) 1488 runs along the western side of the site, parallel to the Ohio River. State Route 754 connects with U.S. Route 42, thereby affording access from the site to Louisville via Interstate 71.

Both SR 754 and CR 1488 will be significantly affected by construction activities. State Route 754, which will provide primary access to the site, will have to be upgraded from Class B (gross load limit: 30,000 pounds) to Class AA (gross load limit: 73,280 pounds). County Road 1488 will have to be relocated to parallel the base of the bluffs on the east side of the site, after which it could serve as a secondary access road. The Applicant will bear the expense of relocating CR 1488.

Effect of Plant Construction on Traffic

Road Traffic

Only limited amounts of material will be transported to the site by trucks during construction of the generating facility. Most of these materials will move on SR 754 from Bedford. However, there will be considerable traffic generated on SR 754 due to construction personnel traveling to and from work, as most construction workers will commute to the site. Construction personnel will have to use either SR 754 or CR 1488 for site access.

Existing traffic on SR 754 and CR 1488 is very light. Peak employment of 695 people during construction (assuming that between 1 and 2 people are carried in a vehicle) will yield approximately 350 to 700 additional vehicles a day on these access roads (see Section 4.3.2, Table 4.3.2-1). These traffic volumes will require that a traffic control system be installed at the intersection of SR 754 and US 42, near Bedford.

Barge Traffic

All of the heavy equipment, most of the fuel required during construction, and materials for the concrete batching plant will be transported to the site by barge. The materials and equipment will amount to approximately 513,400 tons. Table 6.1.4-2 presents a breakdown of the material and equipment tonnages that will be shipped by barge. In terms of tonnage, aggregate constitutes the largest item. An additional 1.5 million tons of coal will be stockpiled during the construction period.

The total 2.0 million tons of material, equipment, and coal to be delivered to the site during construction will require approximately 2,670 barges. At approximately 9 to 15 barges per tow, this amounts to from 178 to 296 barge tows over the 14-year construction period. Timing of deliveries will depend on the actual phase of construction.

Because construction materials will not have to reach the plant site at the same time, the increase in barge traffic would be limited to one or two additional barge tows per week. The Corps of Engineers (U.S. Army, 1975a) has stated that the Cannelton and McAlpine Locks handle an average of 15 barge tows per day, or 105 per week. Thus, the increase in barge traffic from construction of the proposed Trimble County Generating Plant will, on the average, be less than 1 percent. (This figure includes both loaded and empty [returning] barges).

TABLE 6.1.4-2

TRIMBLE COUNTY PLANT SITE
ADDITIONAL BARGE TRAFFIC DUE TO PLANT CONSTRUCTION

Material	Unit #1			Unit #2			Unit #3			Unit #4		
	Tons	Small[a] Barges	Large[b] Barges	Tons	Small[a] Barges	Large[b] Barges	Tons	Small[a] Barges	Large[b] Barges	Tons	Small[a] Barges	Large[b] Barges
Structural Steel	9,850	32	-	9,300	30	-	11,939	40	-	11,939	40	-
		-	12		-	10		-	14		-	14
Cement	16,200	30	-	12,960	24	-	19,514	35	-	17,673	32	-
		-	11		-	9		-	13		-	12
Aggregate	55,800	101	-	44,640	81	-	67,214	122	-	60,872	111	-
		-	37		-	30		-	45		-	41
Sand	36,750	67	-	29,400	53	-	44,267	80	-	40,091	73	-
		-	25		-	20		-	30		-	27
Rebar (over 40,000 lbs)	4,091	16	-	3,273	12	-	4,928	18	-	4,463	16	-
		-	6		-	4		-	6		-	6
Heavy Equipment	1,830	40[c]	-	1,830	40[c]	-	2,314	65[c]	-	2,314	65[c]	-
		-	16[c]		-	16[c]		-	20[c]		-	20[c]

[a] Dimensions - 35' wide x 90' long; capacity - approximately 550 tons.
[b] Dimensions - 35' wide x 195' long; capacity - approximately 1500 tons.
[c] Size of equipment, rather than weight, dictates number of barges required.

Source: Flour Pioneer Inc., 1976.

Table 6.1.4-3 presents the projected increase in commercial barge traffic (in tons) on the Ohio River for the McAlpine and the Cannelton Locks and Dams. The total annual capacity able to be locked through the McAlpine Locks is approximately 120 million tons; for the Cannelton Locks, the capacity is 130 million tons. The projections presented in Table 6.1.4-3 include the estimated construction and operation barge traffic associated with the proposed Trimble County Generating Plant, as well as other power plants scheduled to come on line by 2030.

Effect of Plant Construction on Ambient Noise Levels

Noise generated from the construction activities could be more of an annoyance than noise associated with normal plant operation, due to the length of construction and the intermittent nature of noise associated with construction activities. The principal noise sources are expected to be diesel-powered earth moving and material handling equipment, pumps, compressors, and impact tools. The area of impact will be restricted to the Wises Landing residential area. Because construction will be limited primarily to the daylight hours, annoyance due to loss of sleep should be negligible.

In the latter construction phases, after the screening berm has been constructed, there will be some reduction in the amount of noise reaching Wises Landing.

Effect of Plant Construction on Land Use

Approximately 1,000 of the 2,300 acres comprising the proposed plant site have already been purchased by the Applicant and the residents have moved. Until construction begins, the Applicant is allowing the site land to continue to be cultivated. At the present time, about 80 percent of the land suitable for crops is under cultivation.

With the start of plant construction, land use on the proposed site will be changed from agricultural to industrial. Of the 2,300 acres comprising the site (including the ravines), only about 20 percent are arable. This loss of agriculturally productive land will amount to a loss of approximately .5 percent of the farmland (76,691 acres) in Trimble County. However, because bottomland soils are very fertile, the loss in terms of production potential is larger than the percentage of total acreage.

Effect of Plant Construction on Area Social Structure

The communities of Wises Landing (population 50) near the southern boundary of the site, and Bedford (population 754), which is approximately 6 miles from the site, will be significantly affected by construction

TABLE 6.1.4-3

COMMERCIAL BARGE TRAFFIC PROJECTIONS
MCALPINE AND CANNELTON LOCKS AND DAMS

	Barge Traffic in Million Tons Per Year[a]			
	McAlpine		Cannelton	
Year	Upriver	Downriver	Upriver	Downriver
1968	26.9	12.8	26.5	14.1
1980	40.1	22.4	39.7	23.9
1990	52.8	30.6	52.3	32.5
2000	69.5	37.3	68.8	39.8
2010[b]	91.0	46.5	90.2	49.7
2020[b]	118.7	54.3	117.5	58.4
2030[b]	152.1	64.7	150.6	69.9

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[a] Assumptions used to calculate tonnage are as follows:

1. 15 barges per tow
2. 1,500 tons per barge
3. One-half of traffic is empty barges
4. 30-minute processing time
5. Maximum utilization is 80 percent
6. Size of lock: 1,200' x 110'

In the calculations, the following were not considered:

1. Delay time
2. Down time and stalls
3. More realistic estimate of 9 barges per tow
4. Effects of noncommercial barge traffic
5. Individual lock characteristics

[b] Estimates considered unrealistically high.

Source: U.S. Army, 1976

activities. Wises Landing will be particularly susceptible to much of the noise, dust, and activity generated at the site. Plant construction will result in a disruption and temporary loss of the village's rural character. Bedford will experience much of the traffic going to and from the site.

The county government could be hard pressed to maintain an adequate level of services during the construction period. An influx of mobile homes could necessitate an upgrading of the county's current septic tank sewerage system, and possibly require the implementation of zoning laws. Requirements for a fulltime doctor in Bedford could evolve (at present, there is only a nurse on duty in Bedford).

In 1970, there were only three non-whites residing in Trimble County. Through equal employment practices, the Applicant could introduce approximately 60 non-whites into the county as part of the construction labor force. Though most non-whites will not live in the county, their presence could have an impact on the local social structure.

Effect of Plant Construction on Schools

Although 55 school age dependents may ultimately relocate to Trimble County as a result of construction activities, the school system, which is presently operating near capacity, could accommodate the additional enrollments (May, 1977). This assumes an even grade distribution and an expectation that teacher's aides could be recruited to serve in the school system. These additional demands on the school system could cause a temporary adverse effect; however, tax revenues derived from the relocations would largely offset this impact.

Effect of Plant Construction on Cultural Aspects

There are no significant cultural features in Trimble County that will be affected by facilities construction.

Effect of Plant Construction on Recreation Facilities

Plant construction should have little or no effect on recreation facilities in the county.

Effect of Plant Construction on Aesthetic Characteristics

Aesthetics of the site will change dramatically during construction of the proposed generating facility. Plant construction will result in the transformation of the site from a rural setting to a highly developed industrial setting. In all, approximately 600 acres (excluding ravines) will be disturbed for plant construction. Considering the long-term commitment of land resources required for the generating plant, the transformation of the rural setting will, for practical purposes, be permanent. Some of the most noticeable visual effects of plant construction will include the scraping and grading of the existing farmland and the building of the cooling towers, stacks, and the various components of the generating facilities.

The scraping and grading of the plant site will constitute the first significant visual alteration of the land. During this grading phase, the onsite disposal pond will be constructed on the northern end of the site. The top of the dikes of the pond will reach an elevation of 530 feet, approximately 60 feet above the existing grade. Furthermore, considerable excavation and foundation preparation will occur on the central portion of the site. Earthmoving required for the improvement of plant access, the construction of temporary offices, and parking space for construction employees will also occur.

The most visible features to be erected during the construction phase will be the cooling towers and emissions stacks. The tallest cooling tower will rise 500 feet above ground level, which is approximately 150 feet above the top of the bluffs located on the eastern border of the site. The 760 foot stacks will rise about 410 feet above the tops of the bluffs.

The construction of the barge docking and unloading facilities and the transmission facilities will also alter the visual aesthetics of this rural setting. The barge docking and unloading facilities constructed in the Ohio River will rise 55 feet above the normal pool level. The transmission lines connecting to the switching yard in the southeastern corner of the site will be visible to residents of Wises Landing. A 345-kV line will run from the crest of the bluff just south of Barebone Creek, across the creek and SR 754, and into the switching station at the southeastern corner of the site. From there, towers will be constructed west towards the river along the southern border of the site on the plant side of the screening berm. The river crossing for the 345-kV circuit into Clark County, Indiana will be the most visible portion of this corridor.

In summary, considerable change in the visual characteristics of the site will occur during the construction phase. The height of the cooling towers and stacks will make these features visible for considerable distances. These tall structures may be visible to the residents of Bedford, as well as to persons traveling U.S. 42 and U.S. 421. The visual impact will be particularly strong on persons traveling on the river, SR 754, or relocated CR 1488. The facility will also be visible from Bethlehem, Indiana. There are no major vantage points from the bluffs on either side of the river, as these are heavily wooded for the most part and have no public roads.

Thus far, emphasis has been placed on the alteration of visual aesthetics of the site area because the visual alteration of the site will, in our opinion, result in the most significant impact on the aesthetic quality of the area. In addition, unavoidable dust, noise, and the general activity accompanying the project will also detract from the aesthetic quality of the site and its surroundings. These effects are comparatively temporary, however, and can be minimized by following standard construction procedures for suppressing dust and noise.

Effect of Plant Construction on the Surrounding Area's Quality of Life

Construction of the proposed Trimble County Generating Plant will result in an alteration of local lifestyles and the quality of life in the area surrounding the proposed site. These alterations will result largely from the superimposition of a major industrial facility on a rural setting. The surrounding local population, long accustomed to a lifestyle free of noise, dust, and concentrated activity, will suddenly be subjected to conditions that normally typify a more urban environment. Furthermore, local and county services (e.g., schools, roads, sewage facilities) may be strained by the relocation of personnel to the area. As a result, services and facilities might be loaded to a level where a decline in the existing quality of services could occur. It is doubtful that plant-generated tax revenues could be introduced into the affected area at a date sufficiently early to offset required expenditures. Therefore, the probable initial result of plant construction will be a decline in the quality of life in the area. However, the decline in the quality of services will probably be a temporary effect.

Effect of Plant Construction on Sensitive Areas

Of the seven sensitive areas identified within the general project area (Corn Creek; the oxbow; the Mahoney archaeological site; historical sites in Bedford, Milton, and Hunter's Bottom, Kentucky; and Madison, Indiana; see Section 5.9) two will be directly impacted by construction of the proposed project: Corn Creek and the oxbow. The channel of Corn Creek will be relocated north of its present location, resulting in probable long-term reduced productivity and temporary loss of the creek as a spawning area. The woods associated with the present channel will also be lost until replaced in time with new tree growth. A small portion of the oxbow and its associated bottomland woods habitat type will be lost to construction of the onsite disposal pond.

None of the archaeological sites on the Applicant's property was considered valuable enough by the investigating archaeologist to warrant mitigation.

6.1.5 Transmission Line Construction Impacts

Introduction

The following discussion of primary transmission line construction impacts, except for several specific statements about the Kentucky transmission line right-of-way, is a description of the general kinds of impacts that are likely to result from construction of a transmission line within the preliminary Clark County, Indiana corridor. Until the actual preferred and alternative routes have been identified and a field survey conducted, a specific evaluation of project impacts cannot be made.

To evaluate the probable general impacts of the construction of transmission lines for the Trimble County Generating Plant, the general construction practices of the Applicant need to be considered. The following is a list of the general practices that will be followed by the Applicant during construction of both the Kentucky and Indiana transmission lines.

1. Transmission Line Construction - Transmission line construction is contracted by the Applicant on a "turn-key" basis. Under this arrangement the construction of the line is performed by a contractor. The utility furnishes the material that will be a permanent part of the transmission line, and the contractor furnishes the construction personnel and construction equipment. The clearing of the right-of-way is part of the construction contract. Towers to be used will be of steel lattice-type construction and average 130 to 140 feet in height. The average span length will be 1,000 to 1,200 feet.

2. Right-of-Way Clearing - Normal practice is to clear-cut the right-of-way in areas with flat terrain. In hilly terrain, where the line would span deep valleys, the practice is to clear the area on the hill tops where the towers are to be located but to leave existing trees partway up the hillsides and in the bottom of the valleys--i.e., anywhere these trees do not interfere with the transmission line. A small amount of clearing is necessary along the transmission line centerline in the valleys to allow the contractor to take the conductor pulling-ropes from tower site to tower site.

   Right-of-way agreements with property owners along the right-of-way allow the Applicant to remove danger trees[a] from along the right-of-way. Weak danger trees are cut; healthy trees are topped.

   If a tree is cut, a stump of 3 inches or less is left above the ground line. These stumps are sprayed with a nontoxic basal spray to stop regrowth.

3. Construction Practices - Right-of-way agreements with property owners give the Applicant ingress and egress rights through the owner's property to the right-of-way. Normally, construction of the line progresses along the right-of-way using ingress and egress to the right-of-way from public roads until a stream or other terrain obstacle is encountered. The contractor then bypasses the obstacle, finds a new entrance to the right-of-way further up the line, and travels back to the obstacle from the opposite side.

   The construction work area is limited to the width of the right-of-way. If, because of some problem in a particular area, the contractor has to move outside of the right-of-way, he has the responsibility of (1) obtaining permission from the property owner to travel on his property, (2) of repairing any damage to that property, (3) of paying for any crop damage, and (4) of furnishing the Applicant with a written release signed by the property owner that all repair of damages, including crop damage, has been taken care of to the property owner's satisfaction.

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[a] An individual tree that, because of its height, would hit the transmission lines if it fell.

Damage to the right-of-way during construction is repaired as the construction in that area is completed. Land is returned to its original condition, if this is possible, and areas cleared of trees are revegetated with grass. Crop damage within the right-of-way is paid for by the Applicant. Upon completion of work, the Applicant obtains a written release from each property owner stating that any and all damage was taken care of to the owner's satisfaction.

Measures that the Applicant will take to mitigate transmission line construction impacts are described in Section 7.0.

Impacts on Surficial Soils

The surficial (agronomic) soils of the transmission line right-of-way will be permanently destroyed where excavation of soils for concrete pier foundations is required. In addition to destroying the integrity of the soil at tower locations, the compaction and mixing of the soils within the construction zone reduces the organic content, diminishes fertility, and changes the permeability and characteristics of the affected soils.

In addition, some erosion and runoff will occur near tower structures due to soil displacement, compaction, and removal. There should not be major soil loss through erosion or runoff except in extremely steep areas, such as along the steep uplands south of the plant site and the bluffs of the Ohio River. The destruction of soils with the right-of-way will mean small overall decrease in agricultural productivity on croplands through which the transmission line passes.

Impacts on Terrestrial Flora and Fauna

Flora

Construction of the transmission line will involve loss of vegetation through clearing of land. The approximate acreages and land types that will be affected in Kentucky are:

Wooded land	18.4 acres
Cultivated land	12.7 acres
Open field/pasture	3.4 acres
TOTAL	34.5 acres

The approximate acreages and land types in Indiana are:

Pasture and cropland	251.8 acres
Forest and woodlands	76.3 acres
TOTAL	328.1 acres

Loss of vegetation is an unavoidable consequence of right-of-way development. This impact will be greatest in forest and woodland areas where growing timber stock will be removed, because woodland species require the greatest time to develop. They represent a major loss in terms of time and a moderate loss in terms of commercial value. Pasture and cropland developed for agricultural purposes require less time to develop and consequently are a minor loss. Furthermore, except for land occupied by the towers, right-of-way land can be immediately returned to crop and pastureland uses.

Fauna

The removal of vegetation during transmission line construction has an important effect on the wildlife components of the right-of-way area. All vegetation provides some habitat requirements for a variety of wildlife species. Loss of this vegetation will result in a loss of some wildlife species from the construction area, either by direct destruction or because mobile species will leave the area. Loss of wildlife will be greatest along woodlots and in forested portions of the route.

A preponderance of the wildlife species identified as probable inhabitants of the transmission corridor are considered mobile enough to leave the area of immediate construction activities. Wildlife species that will be most susceptible to destruction by construction activities include non-mobile mammals, amphibians, and reptiles.

The removal of vegetation within the proposed transmission corridor will result in the creation of edge vegetation that will provide forage for wildlife species inhabiting adjacent habitats and cover for invading small rodent species.

Ecosystem Stability

The various ecosystems through which the transmission lines will pass are likely to be affected by the clearing, construction, and general activities involved in transmission line establishment. Construction activities have general effects on the stability, sensitivity, diversity, importance, and vulnerability of the components of these ecosystems.

Stability. The stability of the ecosystems within the transmission corridors will be significantly disrupted during clearing and construction activities. Tree cutting and brush removal in wooded areas will eliminate relatively stable ecosystem components. Vegetation removal will also diminish available woodland wildlife habitat which in turn will diminish the numbers of species that will utilize the area immediate to the transmission line.

Sensitivity. Wildlife and vegetation within the rights-of-way where woodland acreages are involved could be considered sensitive to the clearing of these areas. This sensitivity is related to the continual removal of woodland and replacement by cropland and pasture that has occurred in the general project area for many years. When habitats are removed or diminished in size, they alter the "balance" of both wildlife and vegetation which are characteristic of an area. In this instance, woodland and forestlands are being removed and replaced by open land.

Diversity. As with sensitivity, the diversity of vegetation and wildlife in terms of numbers of different species will be influenced by transmission line placement. The diversity of the woodlands of the area, both in terms of frequency of occurrence and density, will be decreased as they are replaced with open land vegetation. The same is true with the types of wildlife that frequent the woodland sites. Therefore, the overall diversity of wildife and plant species common to the site area will be reduced. While this reduction in diversity will not constitute a drastic impact, it will contribute to the cumulative impact of diminished habitat and species diversity that has resulted from many unrelated land clearing/alteration projects in the area. These projects tend, over the long-term, to bring about changes in both plant and animal ranges by gradually restricting diverse areas.

Importance. The plants and animals of the transmission line right-of-way are similar to those of the surrounding land in composition and distribution patterns. There are no known unique wildlife or vegetation areas within the transmission corridor study area. In a brief field reconnaissance, no plants or wildlife holding rare or endangered status were identified within the study area. The area has undergone extensive man-made modifications, primarily for agricultural purposes. This modification has in large measure been responsible for eliminating any critical, sensitive, or unique areas.

Vulnerability. Wildife and plants of the study area appear to show no significant vulnerabilities that are different in any marked way from those of species adjacent to the study area. The agricultural development of the land has, in the past, been the predominant modification. Any habitat or wildlife species occupying fertile and arable land within the area is subject to greater vulnerability than those in areas of low productivity. Therefore, the biota of the study area are probably more vulnerable to human than to natural stresses. The transmission line construction will constitute a relatively minor addition to this long-term stress, as most of the construction will take place within already modified areas.

Impacts on Water Quality and Aquatic Biota

Because the Applicant's transmission line construction practices take the sensitivity of streams and water bodies into consideration (see Section 7.0), only relatively minor impacts are expected to be experienced by the aquatic environment. Some increased sedimentation and turbidity may result as runoff from construction areas, particularly tower sites, carries eroded material into the streams. Because the streams of the area are in primarily agricultural areas, they are already subject to periodic increases in sedimentation and turbidity from runoff (see Section 6.1.3). In comparison, the amount of additional disturbance resulting from transmission line construction will be minor.

The primary impact on the biota of the streams will result from the increased turbidity and sedimentation that results from construction activities. These impacts would be similar to (in kind), but less (in degree), than those described in Section 6.1.2, especially as these impacts will be of short duration.

Impacts on People

Residents and landowners along the transmission line rights-of-way will be affected to varying degrees by the transmission line construction activities. Individual landowners will lose some acreage from their property, and farmers will lose minor amounts of cropland. In all, approximately 35 acres of land will be affected by the Kentucky transmission line; approximately 328 acres will be affected by the Indiana transmission line.

Annoyance in the form of increased noise and dust levels will be another impact experienced by local residents. These annoyances, although sometimes great, if residences are fairly close to construction activities, will be of short duration.

Increased traffic--both trucks and private vehicles--will occur in the construction areas. This increased traffic may affect the condition of the roads of the area as well as raise the noise and dust levels. Again, these effects will be very temporary.

The visual impact of the transmission lines will vary. In the immediate vicinity of the Trimble County Generating Plant, the transmission lines crossing SR 754 will have a large visual impact. The lines crossing the Ohio River will be visible to the residents of Wises Landing and to traffic on the river. These lines will seem especially incompatible with the surrounding natural setting. The transmission line in Clark County will pass through land that has already been modified by human activity, and will thus, in one sense, not constitute as strong an impact as the lines crossing the river. However, in open areas, which constitute the majority of the corridor, the tall, steel transmission line towers will be especially visible and may be considered to be incompatible with the flat, agricultural setting in which they are placed.

6.2 SECONDARY CONSTRUCTION IMPACTS

6.2.1 Atmosphere

There will be no secondary effects from construction of the proposed Trimble County Generating Plant on the atmosphere, as construction impacts will cease after construction ceases.

6.2.2 Land

Terrestrial Flora and Fauna

Construction activities may indirectly cause a reorientation of the food web of the site area as forage vegetation is removed from the site. Because the amount of forage vegetation that will be lost to wildlife that live on or use the site is large, the stress to vegetation in adjacent areas (as mobile animals attempt to relocate in these areas) may be heavy.

Indirect effects on the wildlife in the plant site area resulting from construction of the Trimble County Generating Plant include the results of forced migration of a diverse wildlife population and the effects of increased noise and human disturbances.

Forced emigration resulting from habitat loss will adversely affect a diverse population of woodland- and field-inhabiting birds, furbearers, game animals, and certain amphibians and reptiles. Because most suitable habitats (i.e., places where all essential needs are met at least minimally) are likely to be already occupied by various individual animals or groups of animals, the level of competition for space, food, and other requirements will be high. Once forced into occupied, unfamiliar territory, animals become more susceptible to other natural and physical limiting factors, such as predation, disease, and adverse weather conditions. Habitat loss, increased competition, and stress will result in fewer attempts by the animals to nest and raise young because not all surviving animals will find suitable habitat. The overall result of habitat loss and the effects of forced migration will be a reduction of animal populations in the plant site area.

Increased noise and human disturbances may result in the disruption of predator-prey relationships, mating behavior, and reproduction success (U.S. EPA, 1971). These impacts will decrease in severity as distance from the disturbance source increases. The magnitude of noise and human disturbance impacts cannot be assessed and will depend on many variables, including the time of year disturbances are produced, their level and duration, and the sensitivity of animals exposed to them.

6.2.3 Water

Effect on Ohio River

The secondary construction impacts on water include increased lockage water requirements, increased hazards on the river, and loss of a source area for river sand and gravel due to the unloading facilities (increased water supply and sewage treatment problems due to the influx of construction workers were discussed in Section 6.1.4).

The amount of water required for single lockage through the main lock at McAlpine Locks and Dam is 118.4 acre-feet (U.S. Army, 1968). Allowing 10 percent for leakage, the total water use per lockage in the main lock is 130 acre-feet.

The maximum practicable number of lockages per day is 34 (U.S. Army, 1968); thus, the maximum total water use per day is approximately 4,400 acre-feet. The minimum river flow is on the order of 14,200 cubic feet per second (cfs). Therefore, the maximum lockage rate requires only 15 percent of the water that must pass through McAlpine Locks and Dam. The amount of additional barge traffic resulting from construction (see Section 6.1.4) will have no detrimental impact on water for lockage.

The barge docking facilities will extend 300 feet from the bankline into the Ohio River channel. These facilities will constitute a new small hazard to navigation on the river. In the Trimble County Generating Plant site reach, the sailing line is toward the Indiana bank. The Kentucky side of the channel is the low velocity side, which is used by tows moving upstream. The unloading facilities will be marked and would offer a threat only to tows that are out of control. Thus, the increased hazard to navigation is considered extremely small.

At the present time, there are four sand and gravel dredges working in McAlpine Pool. The materials that these dredges obtain from the bed of the river are used for construction in the cities of Cincinnati, Louisville, and in the surrounding areas. Because of barge traffic into the dock facilities, the sand and gravel supply companies probably will not dredge the reach of river adjacent to the unloading facilities because the dredges prefer to work in areas where they are not interrupted by river traffic. The loss of this amount of riverbed for sand and gravel supply is not considered important.

Water Quality

The increase in turbidity and sediment resulting from construction activities could mean that users who obtain their water from the Ohio River mainstem downstream from the Trimble County Generating Plant site may have to spend more for water treatment or tolerate more sediment in their water. However, because the nearest major water user is more than 25 miles downstream from the plant site (see Section 5.3.3), the present sediment load in the Ohio River is high, and the turbidity and sediment will dissipate quickly downstream, water quality deterioration as a result of construction should be minimal.

Aquatic Biota

Ohio River fish and mussel populations could be reduced somewhat as a result of construction-related water quality deterioration. The effect on commercial fishing, however, should be minimal because, at present, commercial fishing is not a viable industry in this section of the river.

In addition, construction effects on aquatic biota of the river and associated streams will be short term and should not seriously affect the productivity of the river.

The effect on the biota that presently use lower Corn Creek will be longer lasting. Initially, the productivity of the creek will be completely destroyed. With time, the new channel will be repopulated. The time period before a stable community develops and the nature of this community will be dictated by such conditions as flow regime, substrate, water quality, and shoreline vegetation. The removal of most of North and South Creeks as a source of populating species may also affect the speed with which the new channel repopulates. Particularly affected by the removal of the creek as habitat will be those species presently using the creek for spawning. However, the total productivity of the area should not be significantly reduced by the rechannelization of the creek.

6.2.4 People

The following discussion of secondary impacts of plant construction uses the impact areas defined in Section 6.1.4. As indicated in Section 6.1.4, most of the primary beneficial effects resulting from facilities construction will accrue to the Metropolitan Louisville area, while many of the primary adverse impacts (e.g. noise, dust) will affect the local Trimble County area. Most of the secondary construction effects (e.g. induced employment, additional tax revenues) are beneficial, and some of these effects will benefit Trimble County.

Induced Employment

The employment of up to 695 construction workers between 1978 and 1991 will have the effect of stimulating demand for goods and services in the areas where the workers spend their wages and salaries. This will result in a multiplier effect whereby new jobs are created to meet the increased demand. If it is assumed that, during the peak construction period, 1.3 service jobs are created in response to the spending patterns of the 695 peak construction employees, then construction-induced employment will amount to 904 additional jobs. Most of these new jobs will be created in the Metropolitan Louisville area, where most of the construction employees are expected to spend their salaries.

Some of the construction wages will be spent in Trimble County. However, a large number of service jobs are not expected to become available due to this spending. In most rural areas, there is excess capacity in the service sector; thus economic expansion does not necessarily require the addition of new employees. The spending of construction wages within the local areal will, nevertheless, constitute an economic benefit.

Induced Expansion of Disposable Income

During the construction period, it is estimated that the salaries paid to the construction employees will amount to over $152 million. Of this total, an estimated $107 million will constitute disposable income.

Over time, the spending of this income will result in a multiplier effect, whereby those receiving the dollars that the project workers spend will re-spend a portion of their income in the area. If it is assumed (1) that 50 percent of the total disposable income from the project construction payroll is spent in the Metropolitan Louisville and Trimble County areas, and (2) that a multiplier effect of 2 is operating in this area, then approximately $107 million of additional disposable income, over and above the projected workers' disposable income, should be induced by plant construction.

The amount of induced income that will ultimately benefit Trimble County is largely a function of the spending patterns of the construction laborers. Because of the limited quantity and variety of goods and services available in the county, only a small portion of this income is expected to be spent in Trimble County. If it is assumed that between 5 percent and 10 percent of all project workers' disposable income is spent in Trimble County, then a total gain of between $5.4 and $10.7 million in additonal income (spread over the 14-year construction period) could be expected.

Tax revenues derived as a result of plant construction and wage disbursements will also constitute an economic benefit. These revenues will include monies derived from property, state income, and state sales taxes assessed on the construction workers as well as the induced service employees.

In Trimble County, property taxes will account for a relatively small benefit during the construction phase, because it is unlikely that a significant number of construction workers will relocate to the local area. If it is assumed that approximately 5 percent (35 personnel) relocate to Trimble County and purchase new homes valued at $35,000 (1977 dollars), property tax revenues amounting to $211,500 could accrue to the county. State income taxes levied on construction personnel and the induced service personnel could amount to $6.4 million during the construction period. Total sales taxes could amount to $5.2 million. The revenues derived from the latter two taxes would provide a benefit to Kentucky.

Effect of Plant Construction on Transportation

In Trimble County, the secondary impacts of construction on transportation will be moderate and focused on Wises Landing and Bedford. In both cases, traffic generated as a result of indirect activities associated with construction personnel can be adequately handled by the present system. The construction phase should not create any transportation problems in the Louisville area. (Personnel associated with secondary services arising indirectly from construction activities constitute a negligible percent of the metropolitan population.)

Effect of Plant Construction on Land Use

Considering the existing low vacant house rate in Trimble County and the projections that some construction personnel will relocate to the area, new housing construction should be anticipated. Most of this new housing will probably be located near Bedford. However, no municipal or county development plans presently exist to indicate where this new growth might occur.

Effect of Plant Construction on Cultural Aspects

Secondary impacts of plant construction upon the cultural aspects of Trimble County and Louisville will be negligible.

Effect of Plant Construction on Social Structure

The construction phase of the plant will have little secondary impact on the socal structure of Trimble County. The impact within the Louisville area will likewise be minimal, because most of the indirect labor pool will already be residents of the area.

Effect of Plant Construction on Recreation

The number of people added to the area in order to serve the construction of the plant will be minimal in Trimble County, where most new service jobs will be staffed by local under-employed or unemployed residents. Thus, no additional demand will be placed on recreational facilities in Trimble County. In the Louisville area, existing facilities accommodate the already present work force. Because of this, no service workers will be added to the areas as a result of plant construction, and no new recreational requirements will be generated.

Effect of Plant Construction on Aesthetic Characteristics

Aesthetic characteristics indirectly affected by the project will be in Trimble County, where new structures (possibly service facilities) are likely to be built. Most of this construction will be located in Bedford, possibly near the intersection of US 42 and SR 754, and, to a more limited extent, in Wises Landing. It would be difficult to determine if local residents would perceive such structures as aesthetically pleasing or unpleasing, because the structures could represent some local jobs and additional income. It is unlikely that any new service structures will be constructed in the Louisville area. Existing facilities should be sufficient to accommodate any increased demands created by construction activities.

6.2.5 Effects of Transmission Line Construction

Transmission line construction activities will cause some secondary consequences to the vegetation of the rights-of-way. Concomitant with clearing and brush removal, a change (interruption) of the successional pattern within the plant community will occur. Further, brush clearing may cause an increase in the potential for fires. This is due to the increase in the amount of dry or dead organic matter along the cleared areas concurrent with an increase in human activity in the area. However, as most of the rights-of-way will be through previously cleared land, these potential secondary impacts would be quite small.

Wildlife migration from the transmission corridors will be a consequence of construction activities. Also, the habitat reduction will cause a proportional reduction in the carrying capacity of the area for wildlife species. In addition, there will be an increase in the number of wildlife roadkills due to increased construction traffic in the area.

It is possible that some property value may decrease slightly as a result of transmission line construction for land in the immediate vicinity of the transmission line right-of-way.

No other secondary impacts are anticipated.

6.3 PRIMARY OPERATION IMPACTS

Unlike the previous sections, this section defines environmental impacts likely to be experienced by the atmosphere, land, water, and people by starting with the impact agent--that is, the plant operation that will impact these four environmental components. Because the impacts will still be discussed under the four environmental divisions, however, the impacts of certain operations--such as cooling towers--will be discussed under more than one division.

6.3.1 Atmosphere

Summary of Impacts of Plant Operation

The proposed plant has been designed to meet the New Source Performance Standards for stack emissions.

The EPA Single Source CRSTER model was used to estimate the ambient levels of sulfur dioxide, total suspended particulates, and nitrogen oxides resulting from the operation of the Trimble County Generating Plant. These maximum ambient levels have been added to the maximum concentrations measured by the Air Resources, Inc. monitoring program conducted during four different 30-day periods during 1975. These totals show that the operation of the plant will not exceed any of the secondary or primary air quality standards for these three pollutants. Further, the computed maximum values of sulfur dioxide and total suspended particulates for applicable time periods were less than the permissible significant deterioration increments.

Fugitive dust emissions from plant operations will be controlled as discussed in Section 7.2.

The two natural draft cooling towers are not expected to cause significant impact. Ground-level fogging is expected no more than 19 hours per year. Elevated water vapor plumes will be visible at times, but they are not expected to extend beyond 4.5 kilometers from the plant.

Salt drift from the towers will occur but is not expected to affect areas beyond the plant boundaries.

Introduction

The atmospheric impacts from plant operation will occur over a larger area than other impacts. These impacts are of such potential significance that they are treated separately in the sections that follow.

Flue gas emissions considered in this evaluation are sulfur dioxide (SO_2), total suspended particulates, and nitrogen oxides (NO_x). The impacts from these pollutants on ambient air quality are estimated on the basis of the EPA Single Source CRSTER dispersion model. This model was used to predict 3-hour, 24-hour, and annual average concentrations. Also considered in the following subsections are fugitive dust and cooling system emissions during plant operation and their effects on visibility, icing, and salt deposition.

There are three significant Kentucky and EPA regulations that will restrict the impact of the proposed Trimble County Generating Plant on ambient air quality. In the following paragraphs these regulations will be compared to (1) plant emissions and (2) air quality levels resulting from the plant emissions mixing with ambient air. These regulations are:

1. The New Source Performance Standards (NSPS) that restrict the emissions from the plant to 1.2 pounds of sulfur dioxide, 0.1 pounds of particulates, and 0.7 pounds of nitrogen dioxide per million Btu's of heat input

2. The Kentucky and EPA ambient air quality standards (listed in Table 5.1.2-1)

3. The EPA significant deterioration increments for sulfur dioxide and particulates (listed on page 5-8)

The proposed Trimble County Generating Plant will emit gases and particulates into the atmosphere. The emission rates of these pollutants will depend on the coal composition, the rate at which the coal is burned, and the nature of the air quality control system. Ambient pollution levels after plant emissions have been added to the atmosphere are further dependent on atmospheric and topographical conditions.

Because these quantities will vary with time, it is not feasible to attempt to evaluate the air quality under all conditions. Therefore, this analysis has been directed toward evaluating the maximum impact that the proposed power generating plant could have on the air quality of the area, assuming realistic maximum emission rates and the most adverse local meteorological conditions.

However, all generating units will not become operational at the same time. A summary of the maximum anticipated ground-level pollutant concentrations as a function of the number of units in service is shown in Table 6.3.1-1. All subsequent ambient levels discussed pertain to all four units.

The flue gas emissions from the proposed Trimble County Generating Plant will be maintained within the limits specified by the New Source Performance Standards by means of the control design factors described in Section 4.2.4. Ambient ground-level concentrations of SO_2, NO_x, and total suspended particulates, based on accepted diffusion models, further indicate that state and federal ambient air quality standards and federal Class II significant deterioration increments will not be exceeded during

TABLE 6.3.1-1

MAXIMUM GROUND-LEVEL POLLUTANT CONCENTRATION ($\mu g/m^3$) RESULTING FROM OPERATION OF THE TRIMBLE COUNTY GENERATING PLANT AS A FUNCTION OF THE NUMBER OF UNITS IN OPERATION

	SO_2			Particulates	
	Annual Avg.	Max. 3-Hr.	Max. 24-Hr.	Annual Avg.	Max. 24-Hr.
UNIT 1					
86% efficiency scrubber no reheat	2.4	295	47	0.2	3.1
UNITS 1 and 2					
double liner stack 86% efficiency scrubber no reheat	2.7	391	74	0.2	4.9
UNITS 1, 2 and 3					
1 double, 1 single liner stack 90% efficiency scrubber 20°F reheat	3.5	465	80	0.2	5.3
UNITS 1, 2, 3 and 4					
2 double liner stacks 90% efficiency scrubber 25°F reheat	3.9	471	79	0.3	5.2

operating conditions except at those locations in the vicinity of the Clifty Creek generating plant where ambient air quality levels are already near or above the standards. An interaction study to determine the combined effects of the proposed Trimble County Generating Plant and the Clifty Creek plant was conducted and is described on page 6-40.

The following sections describe in detail the methods and results of the studies upon which the above conclusions are based.

Flue Gas Emission Controls

The Applicant has designed the plant's emission control systems and stack heights to meet Kentucky emission requirements, Kentucky and federal ambient air quality standards, and the federal maximum allowable increments of significant deterioration for SO_2 and total suspended particulates. The operational characteristics that affect airborne pollutant concentrations and that were used to model the behavior of airborne effluents are shown in Table 6.3.1-2. Control of emissions is accomplished by a wet scrubber system for SO_2 removal, electrostatic precipitators for particulate matter removal, and a boiler design to minimize NO_x emissions. These systems are described in Section 4.2.4.

Flue Gas Dispersion Analysis

Maximum expected ground-level concentrations of air contaminants around the proposed power plant were estimated by means of the EPA Single Source CRSTER and Uneven Terrain (Valley) models.

The Single Source CRSTER model used to estimate ground level concentrations was developed by the Meteorology Laboratory of the U.S. EPA in 1972. The model is designed to estimate concentrations due to sources at a single location for averaging times of 1 hour, 3 hours, 24 hours, and 1 year. Estimated concentrations are made for each hour of the year on a radial network of 180 receptor points. This array consists of five downwind distances along each 10° azimuth direction.

The Single Source CRSTER model is based on a modified version of the Gaussian plume equation which uses empirical dispersion coefficients and includes adjustments for plume rise, limited mixing height, and elevated terrain. Pollutant concentrations are computed from measured hourly values of wind speed and direction, and estimated values of atmospheric stability and mixing height. The model assumes a continuous emissions source, steady-state downwind plume, and a Gaussian distribution for concentrations of pollutants within the plume in both the crosswind and vertical directions. Plume rise is estimated using Briggs' equations for hot, buoyant plumes (Briggs, 1971). As the plume expands due to eddy diffusion, it is diluted and transported downwind. The rate of expansion is characterized by a series of empirical dispersion coefficients which are dependent on the stability of the atmosphere, as determined in studies made by Pasquill and Gifford, and reported by Turner (1970). All pollutants are considered to display the dispersion behavior of nonreactive gases.

Meteorological data for 1964 from the airport at Louisville, Kentucky were used as input to the model. The year 1964 was used because it is the

TABLE 6.3.1-2

PROPOSED TRIMBLE COUNTY GENERATING PLANT EMISSION PARAMETERS (AT 100 PERCENT LOAD)[a]

Unit	Load (MWe)	Volume Flow Rate[b] m^3/sec	Exit Gas Temperature (°K)	Emission Rate - gm/sec		
				SO_2	Particulates	NO_x
1	495	716	334	477.1	31.7	427.9
2	495	716	334	477.1	31.7	427.9
3	675	972	334	650.5	43.3	583.4
4	675	976	334	650.5	43.3	583.4

Stack height - 760 feet

4.29 percent coal sulfur content

21 percent excess air

Net heat rate of 9,800 Btu/KWH

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[a] Scrubber efficiency = 90 percent.

[b] Based upon exit gas velocity of 30.5 m/sec.

most recent year for which routinely reported surface observations are transcribed by the National Weather Service on an hourly basis. Data from subsequent years are only available for every third hour, and this is not adequate for the CRSTER model.

Hourly values of the mixing height were determined from:

1. Twice-a-day estimates of mixing height
2. Local standard time of sunrise and sunset
3. Hourly estimates of stability

The upper air station at Huntington, West Virginia was the source of the twice-a-day air observation data used in the model.

The Uneven Terrain (Valley) model is used to estimate long-term average pollutant concentrations for annual periods over terrain other than a flat plain. The model can be used for multiple sources. A short-term concentration option to the model is available. However, extreme care must be exercised when implementing this option due to plume height limitations of the model.

The Uneven Terrain (Valley) model consists of 112 receptors, located on seven concentric circles and 16 radials relative to the center of the source. The location of the seven concentric circles is chosen by the user. A height adjustment to correct for differences in elevation is applied to each of the 112 receptors.

This model is used by the EPA and the Commonwealth of Kentucky to estimate annual ground level concentrations of particulates and sulfur dioxide. Meteorological data from Louisville, Kentucky in the star format are used in this model.

Terrain Effects on Flue Gas Dispersion

The terrain surrounding the proposed plant site is characterized by abrupt changes in elevation. These changes are most pronounced along the banks of the Ohio River, which assumes a north-south orientation in the proposed plant vicinity. Points immediately along the river are generally between 400 and 500 feet above mean sea level, while points only a few kilometers removed from the river are frequently higher than 800 feet and, in isolated instances, 900 feet above mean sea level. These terrain factors were input into the CRSTER model and were taken into consideration in the model calculations of ground level concentrations.

Flue Gas Emissions

The major pollutants emitted into the atmosphere from the main boilers of the plant will be SO_2, particulate matter, and NO_x. The quantities of these emissions will vary with the number of units (boilers) in operation, the operating load of each unit, and the operation of the scrubber and electrostatic precipitators. Maximum impact concentrations have been calculated for all four units on the basis of a 100-percent operating load. This is a very conservative assumption, since the average load during the first 20 years of operation is expected to be approximately 60 percent (25 percent thereafter) which will result in pollutant emission rates approximately 60 percent of the maximum calculated values.

Kentucky Air Pollution Regulation 401 KAR 3:050, Section 3, defines maximum allowable emission rates for new sources. The following table shows the allowable emission rates for the three major pollutants as they apply to the proposed power plant, or any new air pollutant source with a heat input of more than 250 million Btu/hour.

Allowable Rates[a] of Emissions for New Sources

Pollutant	Allowable Emissions
Sulfur dioxide	1.2 lb/million Btu heat input
Suspended particulates	0.1 lb/million Btu heat input
Nitrogen oxides	0.7 lb/million Btu heat input

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[a] For greater than 250 million Btu/hour heat input

Source: Kentucky Air Pollution Regulation 401 KAR 3:050, Section 3

The design SO_2 emissions will be at a maximum rate of approximately 17,880 lb/hr for all four units, or the equivalent of 0.78 lb per million Btu heat input per unit. This is at an assumed full load operation, with 4.29 percent sulfur coal and the wet scrubber system operating at 90 percent efficiency. This emission rate is within the allowable 1.2 lb/million Btu heat input as established in the New Source Performance Standards.

Electrostatic precipitators will control the emission rate of particulates. These precipitators will operate at 99.6 percent efficiency, reducing the emissions of particulate matter to approximately 1,180 lb/hr for all four units, or about 0.051 lb/million Btu heat input per unit. This is less than the allowable emission rate for particulates shown in the table above.

Nitrogen oxides emissions, which will be controlled by boiler design, will be approximately 16,014 lb/hr for all units. This concentration is within the allowable emission rate of 0.7 lb/million Btu heat input per unit.

Ambient Air Quality

Annual Average Sulfur Dioxide Concentrations

Annual average SO_2 concentrations that will be contributed by the proposed power facility were obtained in runs of the Uneven Terrain (Valley) diffusion model. A four-boiler unit with full-load operation and 90-percent scrubber efficiency was assumed. The computed values are for receptors at distances from the source to 5.5 to 7.5 kilometers. These distances were measured in 36 directions. The calculated concentrations are based on 1 year of meteorological data.

The highest annual value computed was 3.9 $\mu g/m^3$. As the present level of sulfur dioxide at the site is approximately 40 $\mu g/m^3$, the concentration is well within the ambient air quality secondary standard of 60 $\mu g/m^3$. Further, the significant deterioration limit of 20 $\mu g/m^3$ for a Class II area is not exceeded.

Maximum 24-Hour Sulfur Dioxide Concentrations

The estimated maximum 24-hour SO_2 concentration contributed by the Trimble County Generating Plant (all four units) is 79 $\mu g/m^3$. The maximum ambient background level is 113.0 $\mu g/m^3$ (Table 6.3.1-3). The estimated maximum 24-hour SO_2 concentration (192 $\mu g/m^3$) resulting from the combination of the maximum concentration contributed by the proposed plant and the maximum ambient background SO_2 concentration is well below the 24-hour primary air quality standard of 365 $\mu g/m^3$. The maximum ground-level concentration is predicted to occur approximately 1.4 kilometers northeast of the plant site.

Maximum 3-Hour Sulfur Dioxide Concentration

The estimated maximum 3-hour SO_2 concentration contributed by the proposed Trimble County plant is 471 $\mu g/m^3$. The ambient 3-hour background level was measured at 331 $\mu g/m^3$. The sum of the plant contribution and the ambient background is 802 $\mu g/m^3$, which is well under the secondary standard of 1,300 $\mu g/m^3$. This concentration is predicted to occur 1.4 kilometers southwest of the plant site.

Sulfur Dioxide Concentrations from Combined Emissions of the Clifty Creek and Trimble County Generating Plants

Maximum ground level SO_2 concentrations from combined emissions of the Clifty Creek and Trimble County Generating Plants were computed by means of the CRSTER model. Meteorological conditions from the day most conducive to the highest 24-hour average SO_2 concentration were used. One receptor was located in Madison, Indiana, and four were located approximately 1.5 kilometers north of the Clifty Creek plant. Furthermore, two receptors were

TABLE 6.3.1-3

COMPARISON OF THE PROPOSED TRIMBLE COUNTY GENERATING PLANT AMBIENT LEVELS[a] TO THE FEDERAL AND STATE AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Interval	Primary Standard ($\mu g/m^3$)	Secondary Standard ($\mu g/m^3$)	Baseline[b] Level ($\mu g/m^3$)	Maximum[c] Calculated	Total Ambient Levels
Sulfur Dioxide	3-hour	-	1,300	331	471	802
	24-hour	365	-	113	80	193
	Annual	80	60	40	4	44
Total Suspended Particulates	24-hour	260	150	123	5	128
	Annual	75	60	57	>1	>58
Nitrogen Dioxide	Annual	100	100	80	4	84

---

[a] Combination of estimated maximum concentration resulting from operation of the proposed plant and maximum ambient background concentration.

[b] Baseline values are the maximum measured values from Louisville Gas and Electric Company's 1975 monitoring program.

[c] Maximum values are those calculated by the EPA Single Source CRSTER model.

placed 1.5 kilometers west and northwest from the Clifty Creek plant, these being the points where the maximum 3-hour and 24-hour average ground level concentrations from the Clifty Creek plant are projected to occur.

The program to compute the combined ground level SO_2 concentrations of the two plants using the CRSTER model consisted of three phases. Phase 1 computed the highest 3-hour and 24-hour concentrations for the Trimble County plant operating at 95 percent capacity. The days when these maximum concentrations occurred were identified. The highest concentrations from the Clifty Creek plant were then computed for the same days that produced the highest concentrations from the Trimble County plant. The Clifty Creek emissions were investigated with the plant operating at 75 percent and 95 percent capacity, to ascertain which mode of operation caused the highest concentration. The concentrations were always higher when the Clifty Creek plant operated at 95 percent capacity; therefore, only these results are indicated in Table 6.3.1-4. The Trimble County and Clifty Creek plants' emissions were then combined to indicate the maximum ground level SO_2 concentrations expected at the bluffs north of the Clifty Creek plant, at Madison, Indiana, and at the points of maximum 3-hour and 24-hour ground level concentration for the Clifty Creek plant.

The aforementioned sites were chosen for investigation for the following reasons:

> Bluffs North of Clifty Creek - Maximum interaction between the emissions from the two power plants was expected to be most likely to occur in this area.
>
> Madison, Indiana - This is the largest population center in the area of influence between the two power plants.
>
> 1.5 Kilometers West and Northwest of Clifty Creek - These points were chosen to demonstrate the Trimble County plant's contribution to the points of maximum 3-hour and 24-hour average ground level concentrations from the Clifty Creek plant.

Phases 2 and 3 computed the highest 3-hour and 24-hour concentrations for the Clifty Creek plant operating at 75 percent and 95 percent capacity. The days when the highest concentrations occurred were identified, and the Trimble County plant emissions were computed for the identical days with the plant operating at 95 percent capacity. It is highly unlikely that both power plants will operate at 100 percent load simultaneously.

The final ground level concentrations attributable to the Clifty Creek plant were computed in two ways for the 95 percent load condition. First, the emissions were computed as the plant operates today (5.6 lb of SO_2 per million Btu emitted). Then they were computed assuming the plant is in compliance with EPA approved emission limitations of 1.2 lb of SO_2 per million Btu.

Results are presented in Table 6.3.1-4. As can be seen, only under the Clifty Creek plant "worst day" condition was the 3-hour secondary SO_2

TABLE 6.3.1-4

MAXIMUM 3-HOUR AND 24-HOUR AVERAGE SULFUR DIOXIDE CONCENTRATIONS FROM COMBINED EMISSIONS OF THE CLIFTY CREEK AND TRIMBLE COUNTY GENERATING PLANTS[a]

(Concentrations in $\mu g/m^3$)

Location of Maximum	Trimble County Highest Concentration With Clifty Creek at Same Day				Clifty Creek Highest Concentration With Trimble County at Same Day			
	3-Hour Concentration		24-Hour Concentration		3-Hour Concentration		24-Hour Concentration	
	Bluffs North of Clifty Creek	Madison, Indiana	Bluffs North of Clifty Creek	Madison, Indiana	1.5 km Northwest of Clifty Creek	Madison, Indiana	1.5 km West of Clifty Creek	Madison, Indiana
SO_2 contributed by Trimble County Generating Plant	74.7	55.8	15.3	10.4	0.1	21.2	0.0009	Negligible
SO_2 contributed by Clifty Creek Plant	Negligible*	88.1*	Negligible*	11.1*	621*	188.9*	106.1*	31.9*
	Negligible**	411.2**	Negligible**	51.8**	2,898**	881.6**	495**	148.9**
Combined Maximum	74.7*	143.9*	15.3*	21.5*	621.1*	210.1*	106.1*	31.9*
Combined Maximum	74.7**	467.0**	15.3**	62.2**	2,898**	902.8**	495**	148.9**

---

[a] Both generating plants operating at 95 percent full load.

*Clifty Creek plant operating at 1.2 lb of SO_2 per 10^6 Btu.

**Clifty Creek plant operating at 5.6 lb of SO_2 per 10^6 Btu (supplied by EPA).

Note: The Clifty Creek Generating Plant is 17 km north of the proposed Trimble County Generating Plant. Madison, Indiana is approximately 16.9 km northeast of the Trimble County plant and 3.3 km east of the Clifty Creek plant.

standard (there is no 3-hour primary standard) of 1,300 $\mu g/m^3$ violated and the 24-hour average standard of 365 $\mu g/m^3$ violated. Trimble County's contribution to this violation is negligible (0.0009 $\mu g/m^3$ for the 24-hour standard and 0.1 $\mu g/m^3$ for the 3-hour standard).

Annual Average Total Suspended Particulate Concentrations

The annual concentrations of total suspended particulates from plant particulate emissions can be estimated from the calculated annual SO_2 concentrations through the application of a contaminant emission ratio. With a full-load operation (four units), the wet scrubber system at 90 percent efficiency, and the electrostatic precipitator at 99.6 percent efficiency, the ratio of particulates to SO_2 emissions is 0.0661. When this ratio is applied to the maximum predicted SO_2 annual mean of 3.9 $\mu g/m^3$, the result is a maximum estimated total suspended particulate annual (arithmetic) mean of 0.2 $\mu g/m^3$. This is well below the state and federal secondary total suspended particulate annual air quality standard of 60 $\mu g/m^3$ and the significant deterioration Class II annual total suspended particulate increment of 19 $\mu g/m^3$.

24-Hour Total Suspended Particulate Concentration

Application of the same emission ratio to the estimated maximum 24-hour SO_2 concentation (due to plant emissions) results in an estimated maximum 24-hour total suspended particulate concentration of 5.2 $\mu g/m^3$ at a point approximately 1.4 kilometers northeast of the plant site. This concentration is well below the state and federal secondary 24-hour total suspended particulate ambient air quality standard of 150 $\mu g/m^3$ (Table 6.3.1-3) and the significant deterioration Class II 24-hour total suspended particulate increment of 37 $\mu g/m^3$.

Annual Average Nitrogen Dioxide Concentrations

Annual average concentrations of nitrogen dioxide (NO_2) from plant emissions can be estimated from the calculated annual SO_2 concentrations through the application of a contaminant emission ratio. This is accomplished by multiplying the annual sulfur dioxide concentrations by the ratio of NO_2 to SO_2 emissions. With full load operation of four boilers and the wet scrubber system at 90 percent efficiency, this ratio is 0.8980. When this ratio is applied to the maximum predicted SO_2 annual mean of 3.9 $\mu g/m^3$, the result is a maximum estimated NO_2 annual mean of 3.5 $\mu g/m^3$. Combined with existing background concentrations of 80 $\mu g/m^3$, the resultant NO_2 concentration is well below the state and federal primary and secondary ambient air quality standard of 100 $\mu g/m^3$ for NO_2 (Table 6.3.1-3).

Sulfate Formation

Sulfur dioxide emitted from the Trimble County plant may oxidize to form suspended sulfate aerosols at rates dependent on ambient relative humidity, temperature, and ozone concentration. Generally, the reaction rates will be on the order of 2 to 3 percent per hour but will be higher with relative humidity greater than 75 percent (such as would be the case during SO_2 plume interaction with natural clouds or cooling tower plumes). During these conditions, water droplets interacting with the effluent plume are likely to become acidic due to the absorption of SO_2 and the formation of sulfuric acid. However, since the SO_2 plume will be "wet" after passing through the scrubbers, reaction rates are likely to be initially high. Thereafter, reaction rates will decrease sharply until the plume reaches ambient moisture levels, unless natural conditions or interaction with cooling tower plumes affect reaction rates. Generally, a significant portion of the SO_2 in the plume will not convert to sulfates until the distance traveled downwind is large (50 to 100 miles), and the plume is dispersed and unrecognizable from background conditions.

Precipitation passing through the SO_2 plume will likewise absorb SO_2 and form acidic sulfates in the rainwater. Data are not available to define the existing levels of acidity in precipitation.

The extent to which the proposed Trimble County Generating Plant will affect the acidity of rainfall near the plant is not expected to be significant, although neither this phenomenon nor the formation of suspended sulfates can be adequately modeled with available technology. Furthermore, because the emissions are limited to less than 1.2 pounds of SO_2 per million Btu heat input, the necessary ingredient for sulfate formation will be limited and unlikely to result in significant sulfates.

Ozone

To date, very few analytical or observational studies have been undertaken pertaining to the impact on ambient ozone concentrations of fossil fuel-fired power plant emissions.

The estimates derived below for the proposed plant's impact on local ozone concentrations are based upon recent field studies carried out primarily at the 1,000-MW Morgantown power plant of the Potomac Electric Power Company (National Academy of Sciences, 1975), about 40 miles south of Washington, D.C. This plant, having twin stacks about 660 feet high, burned a fuel mixture consisting of 75 percent oil (residual No. 6) and 25 percent coal from October, 1973 to August, 1974, the duration of the investigation. Extensive field data on ozone (O_3), nitric oxide (NO), NO_2, and, to a lesser extent, SO_2 were collected from sensors mounted in aircraft flying through the plant's plume perpendicular to the plume centerline at altitudes ranging from 660 to 2,970 feet above the ground.

With regard to O_3 concentrations within the plant's plume, there were two major findings:

1. Ambient O_3 levels were virtually depleted out to distances of 15 miles from the plant. The most probable suggested cause was reaction of O_3 with NO_x to form NO_2

2. Beyond this distance, O_3 concentrations in the plume during daylight hours eventually increased to about 20 to 40 parts per billion (ppb) greater than ambient air concentrations. This was observed to a distance of 35 miles. The amount of increase depends on wind velocity, temperature, humidity, cloud cover, and synoptic weather systems. The cause of this "ozone bulge" was attributed to a complex series of photochemical reactions involving NO_x, SO_2, and the hydroxyl (OH) free radical

Because of the difference between the Morgantown plant and the proposed Trimble County plant in regard to power output, stack height, fuel, stack gas characteristics, pollutant emission rates, surrounding terrain, and meteorological conditions, extrapolation of the above results to the proposed units must necessarily be subjective. However, the precursor pollutants required for the photochemical interactions described above, namely NO_x and SO_2, will also be emitted by the proposed plant. Thus, it is anticipated that the O_3 depletion and "ozone bulge" phenomena will occur. Estimating their degree and extent, however, requires some subjectivity.

Emission of NO_x by the proposed units will probably result in a depletion of O_3 plume concentrations within 6 to 8 miles of the site. This would tend to make negligible any impact of the proposed plant on surface O_3 concentations within the same distance from the site. Beyond 8 miles from the plant, an increase in O_3 concentrations within the plant's plume will probably be due to the photochemical reaction of NO_x and SO_2 with the OH radicals existing in the ambient air. It is anticipated that the increase above background levels will be between 40 and 80 ppb since the proposed plant's power output is approximately twice that of the Morgantown plant. As the plume diffuses to the surface, these O_3 concentrations will be further diluted, making it improbable that the state and federal 1-hour O_3 standard of 80 ppb will be exceeded.

Fugitive Dust

Fugitive dust is particulate matter emitted from any source other than a chimney. It is so named because it is difficult to control. Because fugitive dust is released at or near ground level, it has the potential of causing greater impacts on air quality near the plant than contaminants emitted at greater rates but at higher elevations.

The most significant sources of fugitive dust at the proposed Trimble County Generating Plant site are the following:

Barge unloading facility--coal and limestone

Stack/reclaimer

Active coal pile

Inactive coal pile

Limestone storage pile

The dust will be controlled by acceptable standard procedures (described in Section 7.2). With use of these procedures, fugutive dust is not expected to cause a significant impact.

Effects of Cooling System Emissions

Overall, the effects of cooling tower emissions can be assigned to four categories, which are discussed in the following subsections: elevated visible plume, ground level fogging and icing, drift, and miscellaneous atmospheric effects.

A summary of the numerical model and results used by Environmental Science and Services Corporation (ESSCO) to evaluate the extent and effects of the visible plume is contained in Technical Appendix VIII. Wind direction, wind speed, temperature, and relative humidity frequency distributions for the 10-year period (1951 to 1960) at the Louisville, Kentucky airport were used in the evaluation. The effects of terrain were not included in the analysis since wind tunnel tests by ESSCO demonstrated that the proposed plant's cooling tower plume flow generally parallels the terrain after the initial plume rise.

Visible Plume

Waste heat from the proposed Trimble County Generating Plant will be rejected to the atmosphere by two hyperbolic natural draft cooling towers. As the circulating water cascades through the cooling tower, heat in the water is released to the ambient air through evaporation and sensible (direct) transfer. As a result, the air becomes warmer and saturated with water vapor. As this warm, moist air rises out of the tower and contacts the cooler air outside, condensation usually occurs, and this results in a visible plume.

The plume is assumed to remain visible as long as it contains droplets of condensed water of sufficient size and number to scatter the light and make the plume opaque. This condition is accounted for in the model when the calculated moisture deficit is zero or below, indicating a condensed plume. The average annual frequency and geographical extent of plume length for the proposed Trimble County Generating Plant is presented in Figure 6.3.1-1. These data indicate that the visible plume will rarely extend more that 5 kilometers (3.1 miles) from the plant.

On some occasions, of course, natural fog or low-level clouds will obscure the plume; under these circumstances, the actual length of the plume cannot be judged. This is a shortcoming of available models that treat cooling tower behavior; the vertical distribution of temperature and moisture must be assumed to be either uniform or to conform to a prescribed set of conditions if such data are not measured. Consequently, moist or dry layers aloft, which will alter behavior of the plume, cannot be adequately addressed.

Occasionally, the plume may dissipate and become invisible as it rises, only to reappear as a cumulus cloud at a higher level downwind where conditions are more favorable for condensation.

The longest and most persistent visible plumes are most likely to occur in winter when conditions required to produce saturation most often occur.

Ground-Level Fog and Ice

Because cooling towers introduce large quantities of water vapor into the ambient air, they have the potential for inducing fog at ground level. This potential is minimized by the physical height of the cooling towers and also by the buoyancy of the moist plume, which should generally be sufficient to penetrate low inversion layers. Additionally, natural draft tower plume turbulence is relatively low, and this limits the entrainment of ambient air by the plume, which would otherwise reduce buoyancy and restrict plume rise.

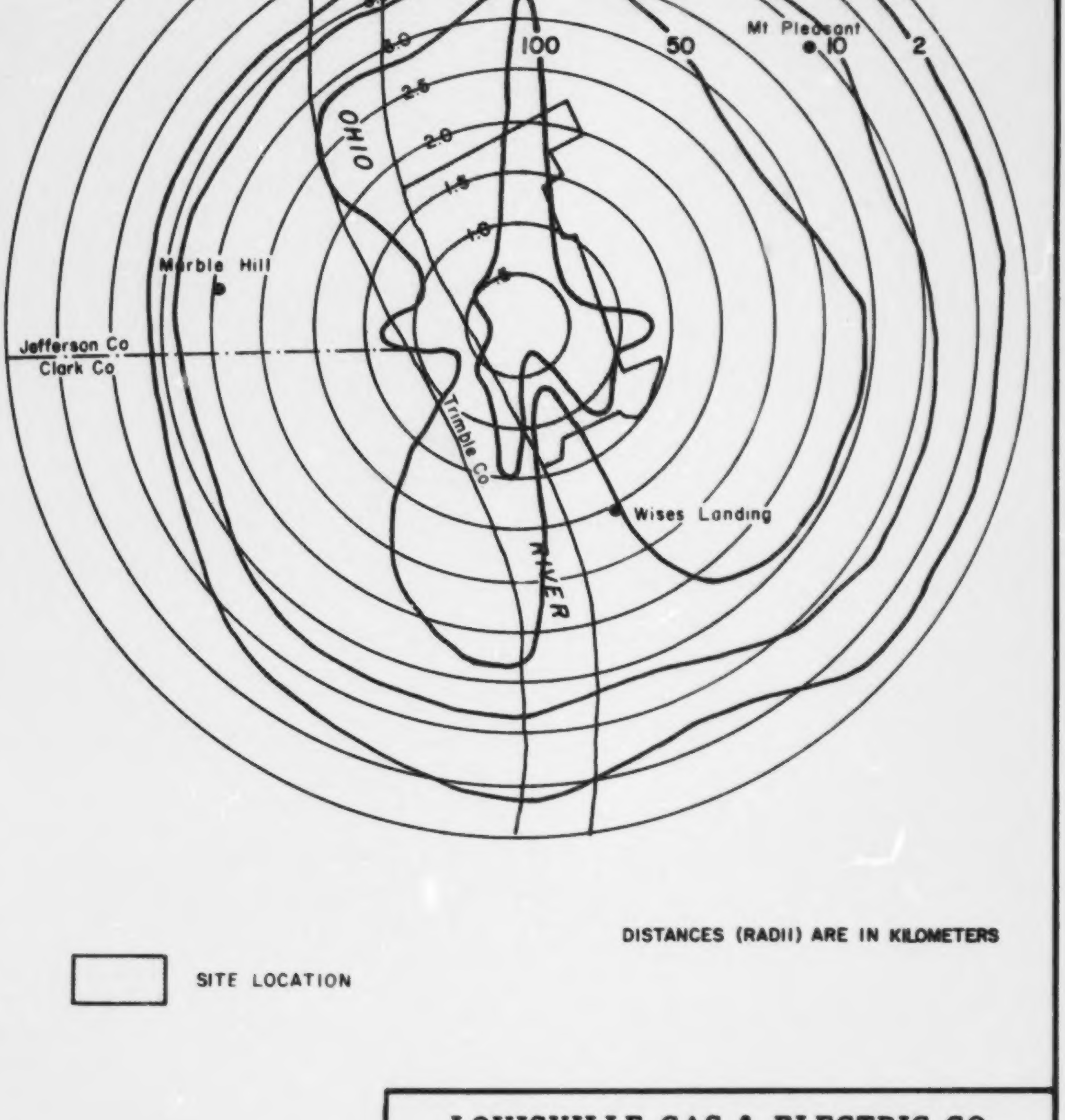
Generally, the only circumstance likely to cause ground-level fog is the "downwash" phenomenon, in which aerodynamic effects associated with high wind speeds may bring the plume down to ground level near the towers. This is expected to occur infrequently with natural draft towers.

Plume trapping beneath an elevated inversion could also, in theory, provide conditions conducive to fogging. However, this phenomenon could not be treated in the model.

Fogging due to the cooling tower plumes was assumed to occur whenever the radius of the visible condensed plume exceeds the height of its centerline above the ground. (The anticipated extent and duration of ground-level fog induced by emissions from the proposed Trimble County Generating Plant cooling towers are shown in Table 20, Technical Appendix VIII.)

Fogging will occur most frequently (19 hours/year) within 0.5 kilometers of the plant. Beyond 2 kilometers, the frequency of occurrence will be less than 1 hour per year. However, incidences of fogging to the south and south-southwest could conceivably present a significant hazard to river traffic by reducing visibility at times when natural fog would not be expected.

Icing is assumed to occur when the cooling towers induce ground-level fog coincident with subfreezing temperatures. In addition to the visibility hazard associated with fogging, the build-up of ice on structures and roadways could present additional safety problems. Results from the numerical model indicate that cooling-tower-induced icing should occur less than 1 hour per year. This is, therefore, not a significant problem.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50
Mt Pleasant
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2
OHIO
Marble Hill
Jefferson Co
Clark Co
Trimble Co
Wises Landing
RIVER

DISTANCES (RADII) ARE IN KILOMETERS

▭ SITE LOCATION

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

AVERAGE ANNUAL FREQUENCY (HOURS) OF VISIBLE COOLING TOWER PLUME LENGTH

FIGURE 6.3.1-1

Drift

In addition to the water vapor plume emitted from the cooling towers, a small portion of the circulating water will be carried out of the tower directly into the atmosphere. This water is in the form of droplets, referred to as "drift," which contain impurities of the river water and chemicals used to control biological growth within the circulating water system. These droplets are subject to gravitational settling after entering the atmosphere and will be deposited at ground level downwind of the plant.

Assessing the extent of drift deposition is a significant problem. Several available numerical models consider the effects of droplet evaporation, salinity, settling velocity, and turbulence, yet none is substantiated by actual observations. Nonetheless, to determine the potential impact of this phenomenon, drift from the proposed Trimble County Generating Plant cooling towers has been modeled. A ballistics approach was used, in which droplet trajectory is evaluated on the basis of the initial plume rise, droplet evaporation, salinity, and settling velocity. A detailed description of the model is given in Technical Appendix IX.

The input parameters used in the analysis are presented in Table 6.3.1-5. Essentially, a conservative, worst-case operation condition with 100 percent load on both cooling towers was used to evaluate drift rates. It is very unlikely that this will be the case under normal circumstances. Circulating river water was assumed to have been concentrated five times due to evaporation during the cycling process, resulting in a total solids concentration of 1,511.5 mg/l. However, some of the time the process will have 1.5 cycles, resulting in a solids concentration of only 453 mg/l. The drift droplets were assumed to be emitted at the rate of 296 gallons per minute from both towers combined; wind direction, wind speed, and relative humidity data were obtained from the Louisville airport. Annual average drift deposition rates were calculated. Although each cooling tower was modeled separately, the results were combined for simplicity of impact evaluation.

Isopleths of annual average salt (solids) deposition rates expressed in units of kilograms/kilometer^2-month are shown in Figure 6.3.1-2. Note that the highest rates occur closest to the plant to the north; this is a function of both the higher settling rate for larger droplets and the predominantly southerly winds. The maximum of 42.37 kilograms/kilometer^2-month (0.12 tons/miles^2-month) is much smaller than the Kentucky secondary standard for settleable particulate rates (15 tons/miles^2-month). (The effects of salt deposition on crop yields and crop quality are discussed in Section 6.4.2).

The geographical distribution of liquid deposition rates expressed in units of gallons/kilometer^2-month is displayed in Figure 6.3.1-3. The distribution is like the solids deposition, but slight differences are to be expected. These differences result from wind speed, wind direction, and relative humidity variations as they affect droplet behavior and salt concentration in the droplet.

It should be emphasized that these solid and liquid drift deposition rates represent annual averages, and that seasonal variations of a factor of 2 are likely.

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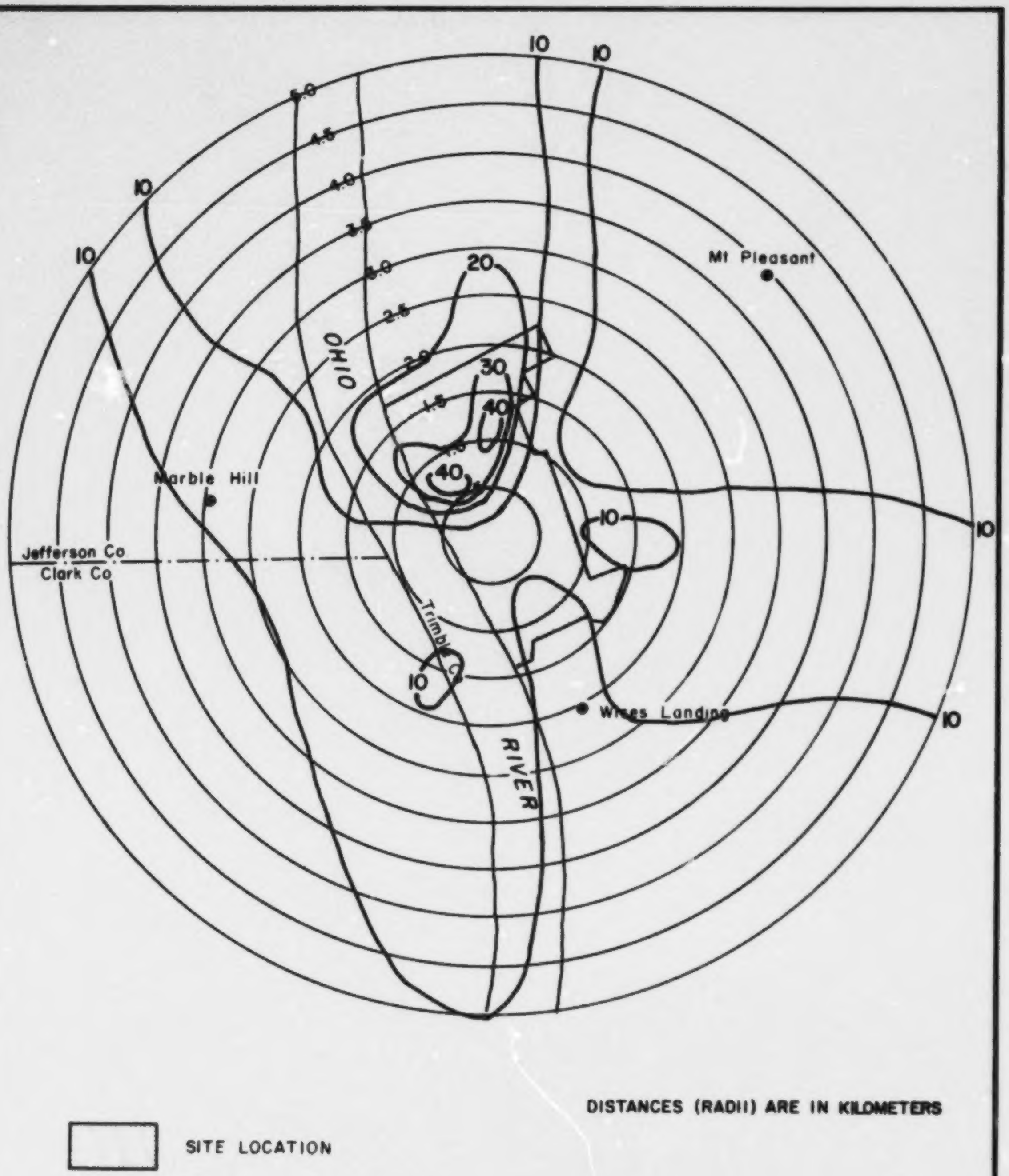
TABLE 6.3.1-5

COOLING TOWER DRIFT DEPOSITION - MODEL IMPACT PARAMETERS TRIMBLE COUNTY GENERATING STATION

	Tower Units 1 and 2	Tower Units 3 and 4
Height (m)	121.9	152.4
Tower Exit Diameter (m)	60	66
Heat Dissipation Rate (Btu/hour)	5.22×10^9	7.10×10^9
Mass Drift Rate (gpm)	126	170
Mineral Concentration (mg/l)	1,511.5	1,511.5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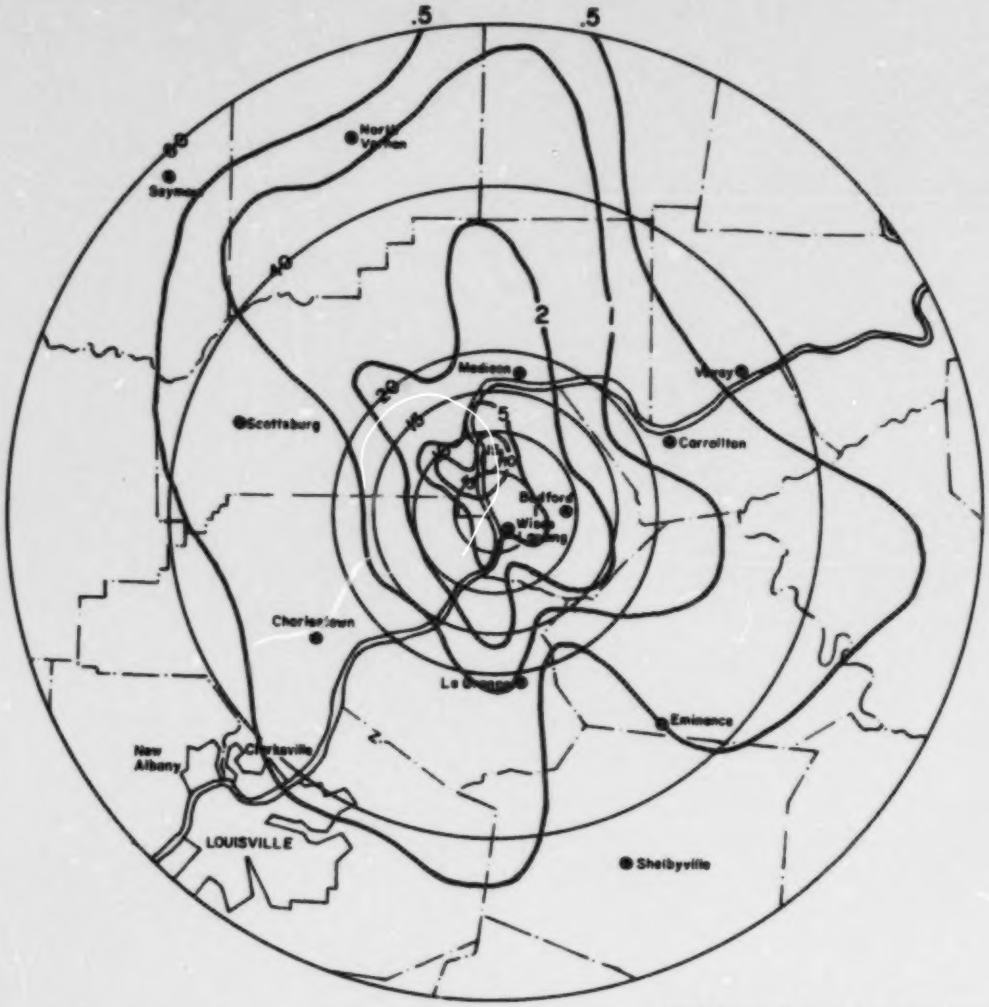
1.5
1.0
20
30
40
40
10
10
10
10
OHIO
RIVER
Mt Pleasant
Marble Hill
Jefferson Co
Clark Co
Trimble Co
Wises Landing
SITE LOCATION

DISTANCES (RADII) ARE IN KILOMETERS

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

ANNUAL AVERAGE DISTRIBUTION OF COOLING TOWER SALT DRIFT DEPOSITION (KG/KM^2-MONTH)

FIGURE 6.3.1-2A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North Vernon
4.0
2
Madison
Vevay
2.0
1.5
5
10
Scottsburg
Carrollton
Bedford
Wises Landing
Charlestown
La Grange
Eminence
New Albany
Clarksville
LOUISVILLE
Shelbyville

DISTANCES (RADII) ARE IN KILOMETERS

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

ANNUAL AVERAGE DISTRIBUTION
OF COOLING TOWER
SALT DRIFT DEPOSITION
(KG/KM²-MONTH)

FIGURE 6.3.1-2B

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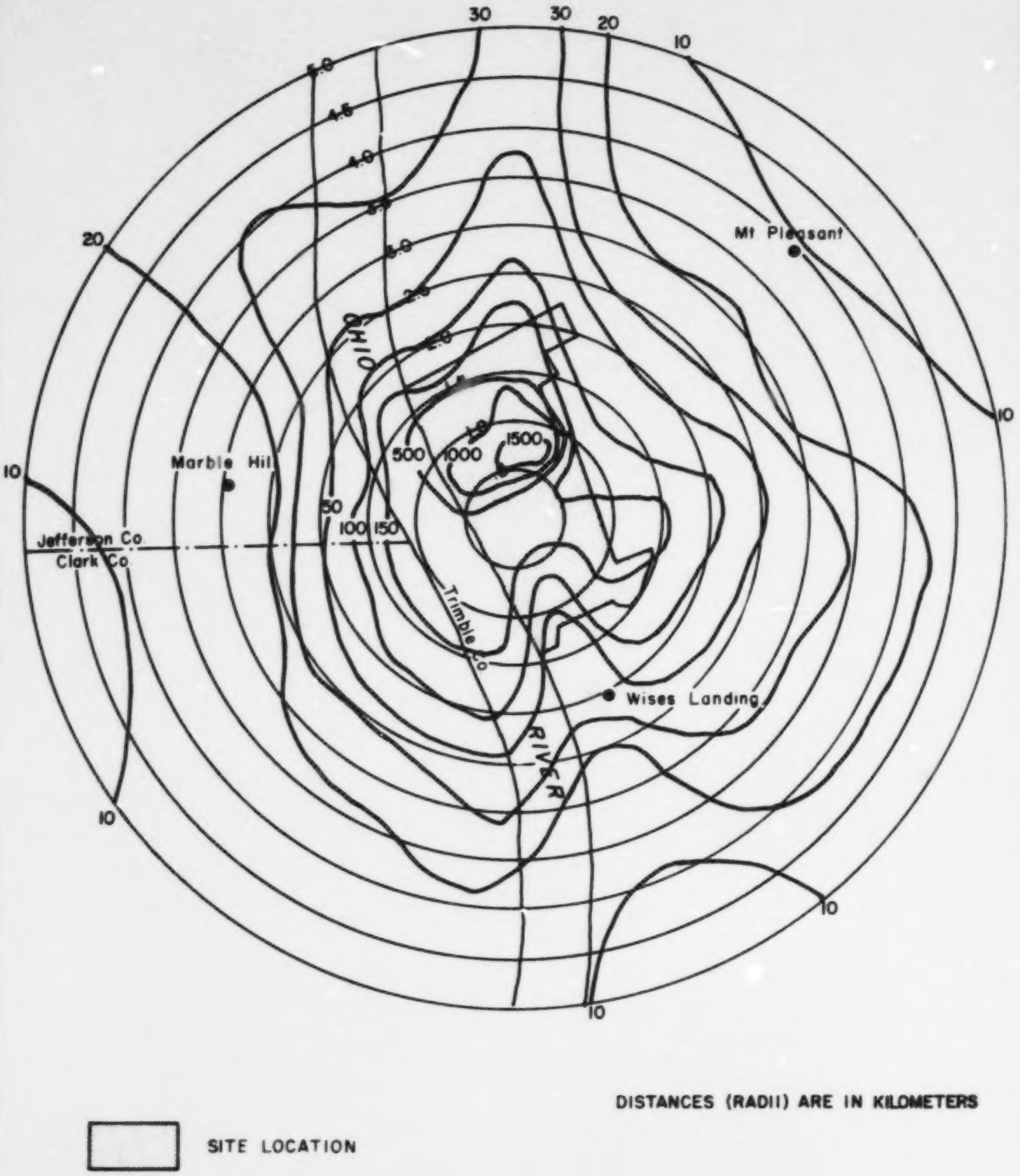
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30
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3.5
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2.5
2.0
1.5
1.0
OHIO
Mt Pleasant
20
10
Marble Hill
500
1000
1500
10
50
100
150
Jefferson Co
Clark Co
Trimble Co
RIVER
Wises Landing
10
10
10
DISTANCES (RADII) ARE IN KILOMETERS
SITE LOCATION

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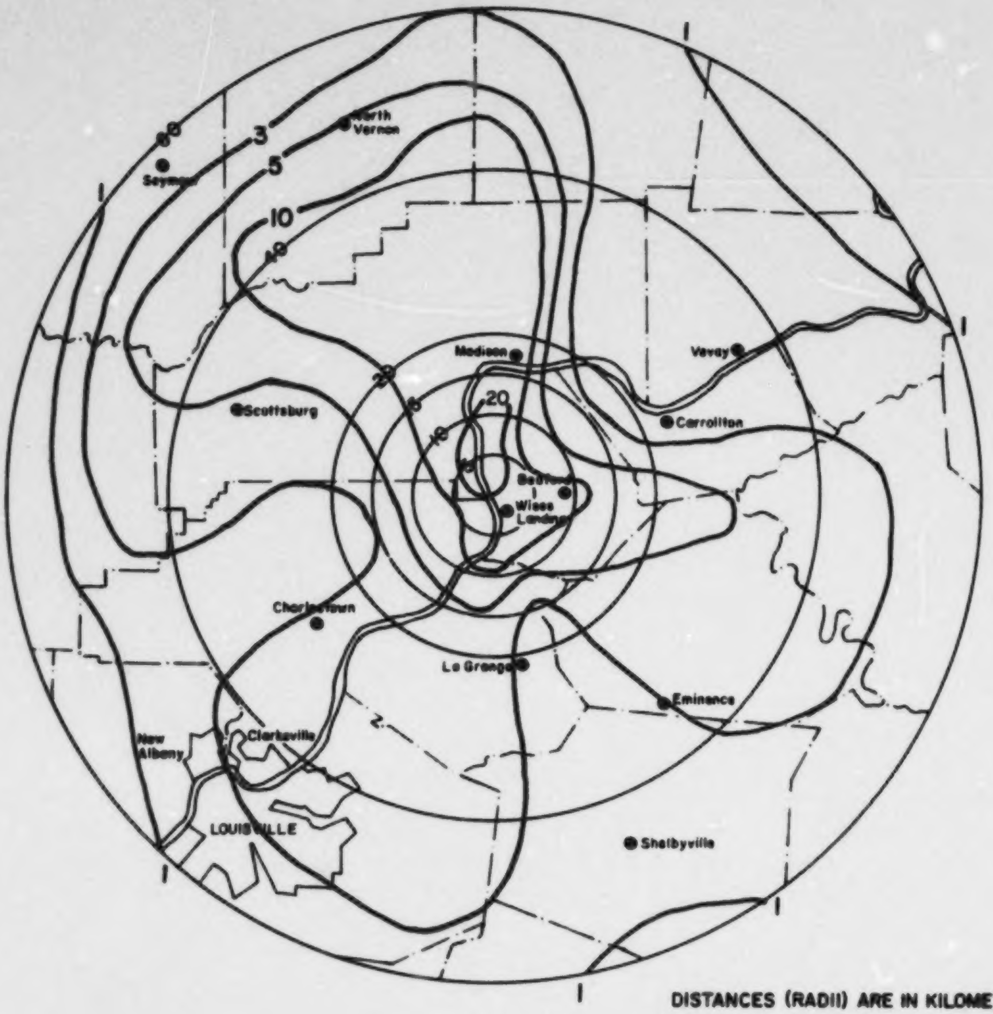
LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

ANNUAL AVERAGE DISTRIBUTION OF COOLING TOWER LIQUID DRIFT DEPOSITION (GAL/KM^2-MONTH)

FIGURE 6.3.1-3A


3
5
10
20
North Vernon
Seymour
Madison
Vevay
Scottsburg
Carrollton
Bedford
Wises Landing
Charlestown
La Grange
Eminence
New Albany
Clarksville
LOUISVILLE
Shelbyville

DISTANCES (RADII) ARE IN KILOMETERS

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

ANNUAL AVERAGE DISTRIBUTION
OF COOLING TOWER
LIQUID DRIFT DEPOSITION
(GAL/KM²-MONTH)

FIGURE 6.3.1-3B

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Miscellaneous Cooling Tower Effects

Potential atmospheric effects from the cooling towers include precipitation and shading. While impacts from these effects are difficult to quantify, they can generally be regarded as very minor.

Published data regarding observed effects of cooling tower plumes on rain are sparse, with conclusions being generally unquantified. It is recognized that cooling towers do contribute to existing atmospheric moisture and, for that reason, are likely to augment existing cloud and precipitation conditions. Concern has also been raised about the potential for thunderstorm initiation or augmentation due to the amount of heat expelled directly to the atmosphere. Nonetheless, the net increase in precipitation which will result from the heat and moisture contributed by the Trimble County Generating Plant cooling towers is believed to be very slight, especially when compared to the natural precipitation occurring in this region.

There also have been reported cases of snow showers or ice crystals being generated by cooling towers. Again, the amounts were very small. Precipitation (other than drift deposition) caused solely by the cooling towers will be rare. Such precipitation would occur as a slight drizzle near the plant perimeter during periods when the plumes are extraordinarily dense. The total precipitation amounts which will result from the effects of the cooling towers are considered negligible.

A reduction in the amount of natural sunlight reaching the ground will occur beneath the cooling tower plume. The amount of sunlight reduction will depend, to a degree, on the size and density of the plume. The largest and densest plumes are most likely to occur during atmospheric conditions that also favor natural cloud formation, or during periods when sunlight would probably be restricted whether a plume was present or not.

The major concern with a loss in natural sunlight is the possibility of a decrease in crop production. However, such a decrease is unlikely for the following reasons.

1. The loss of sunlight resulting from cooling tower plumes is very slight. In a recent study conducted in Switzerland, it was determined that, during the summer months, the loss of 1 percent of expected sunlight resulting from cooling tower plumes extended to an average distance of less than 0.5 kilometers. This 1 percent loss in sunlight was equal to about 4 minutes per day. During the winter, when crops are not growing, the affected area was significantly larger, extending to an average distance of about 1.6 kilometers. This 1 percent wintertime loss in sunlight is equal to about 17 minutes per day (Junod, et al., 1974)

2. Cooling tower plumes seldom extend beyond 3 miles (approximately 5 km)

3. The largest and most dense plumes from cooling towers occur during the winter months

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Effects of Air Pollution on People, Plants, and Animals

The effects of the pollutants emitted by the proposed Trimble County Generating plant on people, plants, and animals are discussed in Sections 6.3.2 and 6.3.4.

6.3.2 Land

Effects of Solid Waste Handling and Disposal

Geology

No significant impact on geologic structure, stratigraphy, or lithology is expected from plant operation.

Surficial Soils

The topsoil in Ravines RA and RB will be buried beneath the solid waste landfill during plant operation. The major impact of this action will be a permanent change in topography.

The total amount of soil to be buried is 660 acres in Ravine RA and 780 acres in Ravine RB. The soils in the ravines are Beasley-Nicholson-Fairmount soils, which are thin, of low agricultural value, and occupy steeply sloping terrain. The loss of the soil is thus not a major impact.

Terrestrial Flora and Fauna

During the projected 30-year life of the proposed Trimble County Generating Plant, solid waste disposal will result in the gradual but complete elimination of all vegetation and wildlife from Ravines RA and RB.

Animal losses associated with solid waste disposal and the effects of forced wildlife migration have been discussed under Primary and Secondary Construction Impacts. Likewise, the effects of increased noise and human disturbance have also been discussed under these headings.

Effects of Atmospheric Emissions

Air pollution from coal-fired power plants can cause significant injury and damage to vegetation. Generally, the air pollution injury to plants is divided into three categories: acute, chronic, and subtle (NERC, 1973; Jones, et al., 1974). Acute injury is due to a specific high-concentration exposure that results in rapid visible death of plant tissue. Chronic injury is due to long-term exposure to lower pollutant concentrations that results in slow development of visible injury symptoms, including chlorosis, abscission, and eventual death. Subtle injury is due to long-term exposure to low pollutant levels, resulting in gradual disruption of physiological processes and nonvisible reductions in growth and yield.

Both the acute and chronic injury classes may be defined as primary air pollution injury effects, whereas the subtle class, due to its covert nature and protracted time period, is generally characterized as a secondary air pollution effect. Secondary effects, although long-term, are significant in reducing overall plant health and vigor. For convenience, the discussions of primary and secondary effects are combined.

National standards have been established by the Environmental Protection Agency for those air pollutants harmful to the public health (i.e., having effects on mortality and morbidity) and welfare (i.e., having effects on vegetation, materials, visibility, and the like). Five pollutants have been identified as requiring standards: total suspended particulates (TSP), photochemical oxidants (PCO), SO_2, carbon dioxide (CO_2), and NO_2 (Hoffman, et al., 1975). Of the five, three (NO_2, SO_2, and TSP) will be produced by the proposed Trimble County Generating Plant at the site. In addition, salt drift deposition resulting from cooling tower operation is likely to occur. Within a 7.5-mile radius of the site are very intensively cultivated areas in Indiana (Clark and Jefferson Counties) and Kentucky (Trimble County), and plants known to be affected by these three pollutants are among the economically important crops of the area (Tables 6.3.2-1 and 6.3.2-2).

Few generalizations can be made regarding the effects of air pollutants on terrestrial plants. Some of the variables known to be important in determining the intensity of injury to a plant include the stage of development of the plant; the genetically determined susceptibility of the plant to various pollutants; climatic factors such as temperature, humidity, and the duration and intensity of sunlight; interactions between pollutants, and whether they are additive or synergistic (i.e., the effect of the two pollutants acting together is greater than both acting alone); time of day and extent of exposure; and soil moisture.

Two generalizations are possible: (1) plants are most susceptible to air pollution during the active spring and summer growing season, and (2) high-concentration, short-term exposures are more damaging than long-term exposure to moderate pollutant levels.

One reason for the difficulty in evaluating and forecasting air pollution effects on plants is the difficulty of detecting cause of injury. Decreased yields may occur in the absence of easily identifiable symptoms of injury. Further, it is difficult to determine the active pollutant causing plant injury. Most injuries and damage to plants by airborne pollutants are caused by oxidants, and there is evidence that mixtures of two pollutants can act synergistically to produce more profound effects than would be produced by either one of the two pollutants by itself in the same concentration. For example, Heck (1973) reports that tobacco leaves were injured by mixtures of ozone and SO_2 at a level of concentration that would have been harmless if either of the chemicals had been present separately. Mixtures of SO_2 and NO_2 frequently act synergistically to produce injury and damage to plants (Menser, 1971b).

TABLE 6.3.2-1

CLOSEST POLLUTION-SENSITIVE CROPS WITH THEIR DISTANCE AND DIRECTION FROM THE CENTER OF THE PLANT SITE

Crop	Bearing	Distance	Location
Tobacco	000°	1.23 mi	Kentucky (Trimble County)
Tobacco	045°	1.23 mi	Kentucky (Trimble County)
Soybeans	070°	3.4 mi	Kentucky (Trimble County)
Pasture and Corn	090°	1.4 mi	Kentucky (Trimble County)
Pasture and Corn	150°	0.9 mi	Kentucky (Trimble County)
Corn	210°	1.1 mi	Indiana (Clark County)
Pasture and Corn	235°	1.1 mi	Indiana (Clark County)
Corn	300°	1.5 mi	Indiana (Clark County)
Apple Orchards	310°	2.9 mi	Indiana (Jefferson County)
Pasture and Corn	322°	0.9 mi	Kentucky (Trimble County)

TABLE 6.3.2-2

ECONOMICALLY IMPORTANT VEGETATION OF THE PLANT SITE OR ADJACENT AREAS RECORDED AS SENSITIVE TO VARIOUS AIR POLLUTANTS TO BE EMITTED BY THE PROPOSED TRIMBLE COUNTY GENERATING PLANT[a]

Nitrogen Dioxide	Ozone	Sulfur Dioxide
Bluegrass	Alfalfa	Alfalfa
Rye	Clover	Apples
Tobacco	Oats	Clover
	Orchard grass	Oats
	Rye	Pears
	Sweet corn	Rye
	Tobacco	Soybeans
		Vegetables (beets, beans, carrots, etc.)
		Wheat

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[a] Table adapted from University of Louisville, 1975a.

Sulfur Dioxide

Sulfur dioxide can cause serious, acute, and chronic plant injury. Acute injury is likely to result from heavy, short-term dosages. However, it is difficult to interpret the effects of 24-hour maximum SO_2 levels because of the general lack of information concerning 24-hour concentrations and plant injury.

The highest predicted combined 24-hour concentrations (see Table 6.3.1-3) are less than 365 μg/m^3. This level is not sufficient in itself to cause plant damage, but could be injurious when combined with NO_2 or ozone (Linzon, 1973).

The maximum combined 3-hour SO_2 concentration is estimated to be 802 μg/m^3 (Table 6.3.1-3). This amount is not harmful except to the most sensitive plants, which have thresholds ranging between 785 and 1,570 μg/m^3. The threshold for intermediately sensitive plants ranges between 1,570 and 2,095 μg/m^3, and for resistant plants, greater than 2,095 g/m^3 (Jones, et al., 1974). These threshold values are conservative, representing only field data, and it should be noted that NERC (1973) provided ranges for these same rankings that are higher and broader but are based upon a mixture of laboratory and field data.

Chronic injury to plants can be expected during long-term average dosages of 60 μg/m^3, or of 40 μg/m^3 or more for lichens, the plants most sensitive to SO_2 (Linzon, 1973). The present average annual SO_2 concentration at the site is 40 μg/m^3, to which the proposed plant would add 4 μg/m^3.

Nitrogen Dioxide

One pollutant that affects the terrestrial environment is NO_2. Nitric oxide and NO_2 are the two more significant gases in the NO_x group of pollutants produced primarily by high-temperature combustion. The major reason for the importance of NO_x as pollutants is their participation in photochemical reactions which produce ozone and the peroxyacyl nitrates (PANs), two highly plant-damaging oxidants.

Dosage response relationships with NO_2 are difficult to assess from published reports because of the lack of extensive experimentation and the wide ranges of plant species, toxicant concentration, and exposure duration which were used. External factors reported to affect plant sensitivity to NO_2 include soil moisture, light, and relative humidity, but information in these areas is limited. The few experiments conducted to study the effects of external factors have revealed that susceptibility was reduced by soil moisture stress, full sunlight, and low relative humidity.

Plant species vary widely in susceptibility to NO_2, and the threshold dosage required to produce injury on a specific plant may be affected significantly by the environmental conditions under which the plant was growing when exposed. Background level data for NO_2 at and near the proposed plant can be considered insignificant (see Section 6.3.1) so far as plant life is concerned.

Total Suspended Particulates

Particulate emissions are not generally considered to be harmful to vegetation unless they are highly caustic or unless heavy deposits occur. Heavy particulate deposits are known to form encrustations on leaves of vegetation, with a resultant reduction in photosynthesis, vigor, and hardiness of the plants. However, particulates are not generally considered to be phytotoxic pollutants of major importance; thus, suspended particulate emissions can generally be disregarded from the standpoint of plant injury. Settleable particulates, as noted above, can be injurious to plants. A discussion of settleable particulates appears in Section 6.3.1.

Salt Drift Deposition

The deposition of river salts and minerals emitted from the two natural draft cooling towers may have some effect on biota and soil in the immediate vicinity of the site. This effect will be most prominent in the soil and vegetation in the immediate vicinity of the plant.

In soils, chloride ion concentrations from 10 to 75 parts per million are acceptable for the normal vigor of most plants produced from cultivation. Accumulations of salt from 100 to 200 parts per million are excessive and cause reduced yield and vigor. Normally, salt is rapidly leached from the soil during precipitation. However, if precipitation or drainage is lacking, it is possible for large-scale accumulations to occur. These conditions could occur most frequently during the height of the growing season, when the time between rainfall events is often 1 week or more. Under normal meteorological conditions, salt accumulation should not present a problem to agriculture; during dry periods, yields could be affected by the accumulation of salt.

The effects of salt on plants can be seen primarily in a phenomenon called "burning" or necrosis. Leaves of deciduous species normally are the first to exhibit salt effects by a general burning of the leaf tips and margins; this progresses as the salt injury increases. Buds and twigs, including flowers and fruit, can be similarly affected. In the conifers, needle burn is exhibited from the tip to the rear of each leaf as the injury progresses. Leaf scorch is characteristically exhibited as a change from green to a straw or orange color as the result of salt poisoning. There are some plants that are highly resistant to scorch by salt; however, each species has a concentration threshold that, when reached, decreases plant vigor. Plant mortality eventually ensues.

Of particular concern in the vicinity of the Trimble County plant is the effect of salt deposition on fruit orchards and tobacco plants. If deposited in sufficient quantities, leaf damage could occur, ultimately resulting in lower market values. Since tobacco sales are a source of supplementary income on some farms, the impact to the local economy could be significant.

However, the highest salt deposition rates are expected to occur in the immediate vicinity (within 1-2 miles) of the plant, where farming activities are minimal. Further, because the source of makeup water for the cooling towers (the Ohio River) is not particularly saline (see Table 5.3.2-2), the impact potential is further reduced.

Effects of Fuel Handling

No significant primary impacts on land are projected to occur from the operation of the fuel handling facilities of the Trimble County Generating Plant.

Effects of Transmission Facilities

No significant primary impacts on land are projected to result from the operation of the transmission facilities of the Trimble County Generating Plant.

Effects of Noise Emissions

Although the noise levels in the vicinity of the proposed facility will be significantly higher than those now present, they are expected to have no impact on the terrestrial fauna of the Trimble County plant site. Animals soon become inured to constant background noises, as long as these do not reach the pain threshold.

6.3.3 Water

Effects of Plant Operation on Water Quantity

The entire plant service and cooling water supply for the proposed Trimble County Generating Plant will be obtained from the Ohio River. The maximum peak water intake rate (all four units) for the plant will be 69,000 gpm (154 cfs). This intake rate represents approximately 1 percent of the 30-day, 10-year low flow (13,750 cfs) in the Ohio River. No adverse effects on the currents or sediment transport capability in the river are anticipated for this rate of water withdrawal.

The maximum peak water consumption (all four units) anticipated for the plant is 28,100 gpm (63 cfs). Most of this amount (22,800 gpm or 51 cfs) will be lost through evaporation and drift from the natural draft cooling towers. This consumption represents less than .05 percent of the anticipated low flow in the Ohio River at the site.

The projected consumptive water use in the Ohio River basin for the year 2020 is 4 billion gallons per day. Most of this will be for electric power generation (U.S. Army, 1969). The Ohio River Basin Comprehensive Survey indicates that the basin has adequate water resources to meet the annual projected electricity generation to the year 2020, as well as other uses.

The maximum peak cooling water discharge from the plant (all four units) is estimated at 40,900 gpm (91 cfs). No plant process water will be discharged.

Effects of Plant Operation on Surface Water Quality

Thermal Discharge

The thermal content of the proposed Trimble County Generating Plant discharge is governed by the following two criteria:

1. The maximum allowable heat-discharge rate is given by the equation—$Q_h = 0.9 \times 62.4 (T_A - T_R)$

   in which Q_h = maximum allowable heat discharge rate, Btu/sec

   Q_w = measured river flow (but not less than 11,900 cfs at the Trimble County plant site)

   T_R = daily average river temperature upstream from the discharge

   T_A = maximum allowable temperature in the river, °F, as specified in the following table:

	T_A		T_A
January	50	July	89
February	50	August	89
March	60	September	87
April	70	October	78
May	80	November	70
June	87	December	57

2. In no case shall the aggregate heat-discharge rate be of such magnitude as will result in a calculated increase of more than 5°F in river temperature, outside the mixing zone

The discharge outlet will be a gravity flow outfall (see Section 4.2.3) structure and will be located downstream of the unloading facilities and water intake structure. The outfall structure will be designed to promote suitable diffusion of the effluent in a relatively small mixing zone with no serious effect on bottom materials and aquatic life. The outlet will be submerged at all river flows.

During periods of extreme flood levels, the gravity flow system will not function. Should such a condition occur, a provision for overflowing into open channels will permit discharge.

The thermal plume resulting from the cold side cooling tower blowdown discharge will be small in size and will not significantly increase the river ambient temperature during any season or any discharge condition outside a reasonable mixing zone. For all discharge conditions and all seasons, the thermal plume will be within 2°F of ambient river temperature at a distance of less than 400 feet from point of discharge. More than 50 percent of the heat in the discharge will be dissipated within 50 feet of the point of discharge. The draft NPDES permit (Appendix T) for the proposed plant defines the conditions that must be met by the blowdown discharge. The mixing zone predicted for the thermal plume (see Technical Appendix X) will protect indigenous aquatic organisms from adverse thermal effects.

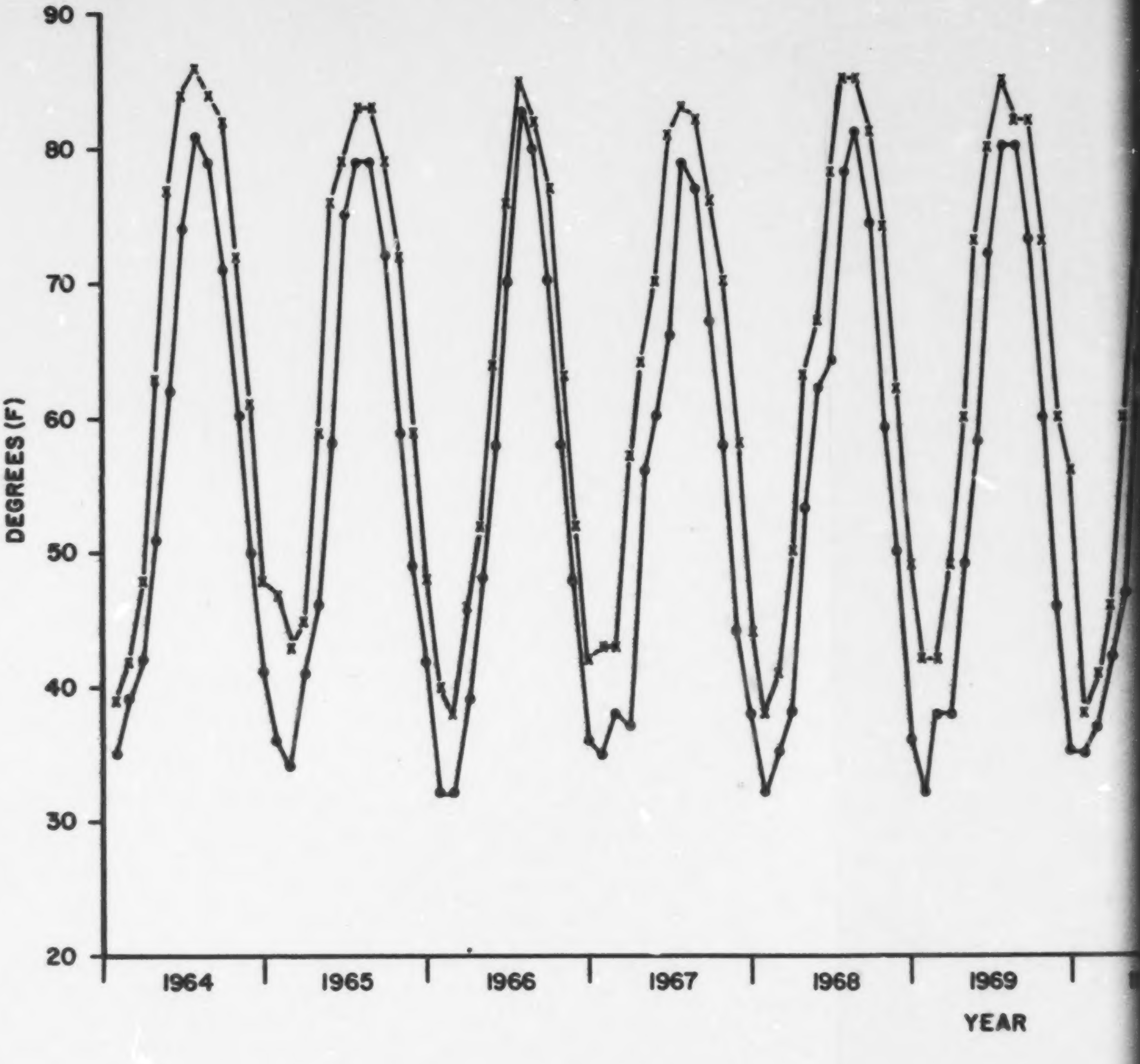
The effect of thermal discharges on the temperature of the Ohio River water has been studied recently by the Ohio River Valley Water Sanitation Commission (1974) and the West Virginia Department of Natural Resources. The conclusion was that the thermal discharges for the 34 operating power facilities on the Ohio main stem (total plant capacity = 27,000 MW) were causing no recognizable trend of rising river temperatures (Ohio River Valley Water Sanitation Commission, 1974).

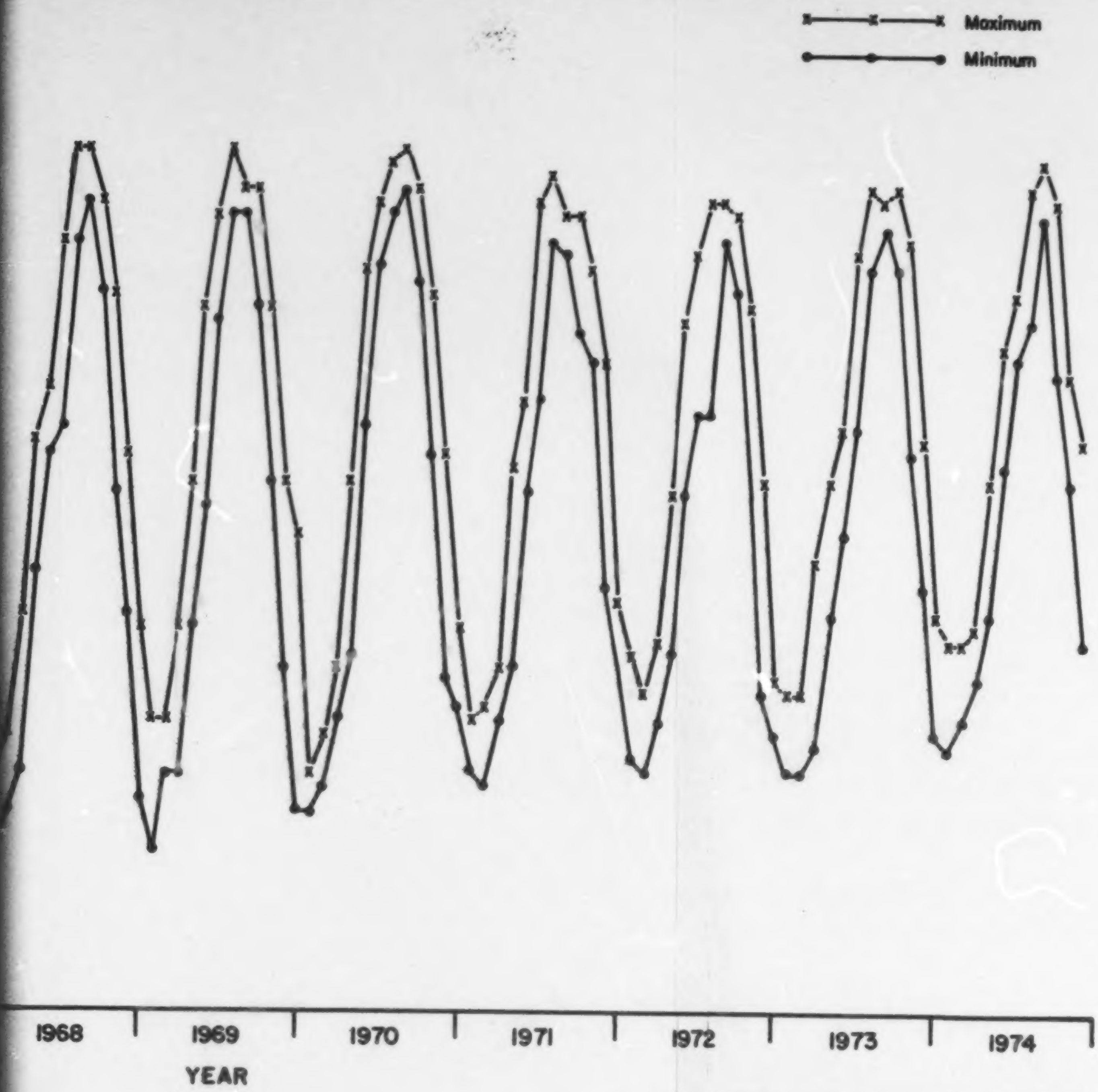
The river water temperatures at Louisville, Kentucky for the 10-year period starting January 1964 are shown in Figure 6.3.3-1. The upward trend in annual minimum monthly temperature starting in 1970 is not considered significant (Ohio River Valley Water Sanitation Commission, 1974).

Chlorine in Discharge

The EPA is concerned with the potential toxicity of chlorine from a discharge of cooling tower blowdown directly to the river. Consequently, the EPA asked the Applicant to conduct plume dispersion modeling to allow development of a permit limitation for total residual chlorine and to allow development of a mixing zone. The EPA defines 0.01 mg/l total residual chlorine as the design criteria to protect the most sensitive indigenous aquatic organisms (Quality Criteria for Water, July 26, 1976, p. 61).

The plume dispersion study conducted by the Applicant concludes that a subsurface multipipe diffuser can be used for blowdown discharge to comply with EPA and Kentucky regulations for the protection of river fish populations (see Technical Appendix X). The predicted concentration of 0.2 mg/l chlorine at the point of discharge for all average seasonal conditions and for the 7-day, 10-year low river flow conditions modelled in the study will result in a mixing zone with a plume centerline length no greater than 140 feet and a width of 100 feet. The mixing predicted to take place within these maximum distances will result in a reduction of total chlorine concentrations to 0.01 mg/l. The predicted mixing zone size is somewhat larger than normally found, but is only 6 percent of the total cross-sectional area of the river, thus allowing for sufficient free passage of aquatic organisms.


90
80
70
60
50
40
30
20
DEGREES (F)
1964
1965
1966
1967
1968
1969
YEAR



LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

OHIO RIVER WATER TEMPERATURES
AT LOUISVILLE, KENTUCKY
RIVER MILE 600.6

FIGURE 6.3.3-1

The EPA has concluded that the design of the discharge structure, coupled with a maximum instantaneous chlorine concentration of 0.2 mg/l in the cooling tower discharge, will result in an acceptably small impact to the biota and water quality of the Ohio River.

Other chemicals discharged with the blowdown (discussed in Section 4.2.3) are calcium, magnesium, sodium, potassium, alkalinity, chloride, sulfate, phosphate, and silica. Water collected in the sediment retention basin (see Sections 4.2.3 and 4.3) will be released to the river. The discharge from this basin will be controlled and monitored as indicated in the draft NPDES Permit (Appendix T). The concentration of contaminants in these two discharges, including pH, will not exceed levels defined by Kentucky, Ohio River Valley Water Sanitation Commission, or federal standards.

Effects of Plant Operation on Ground Water Quantity

During operation of the proposed Trimble County Generating Plant, ground water will be used only for potable water and for sanitary facilities. The average ground water withdrawal will be approximately 11,000 gallons per day, based on an estimate of 350 operating and maintenance personnel. All other water required for plant services will be taken from the Ohio River.

This withdrawal of ground water will not adversely affect the ground water aquifer underlying the site or wells in the surrounding areas.

Effects of Plant Operation on Ground Water Quality

The quality of ground water in the glacial outwash aquifer underlying the proposed Trimble County Generating Plant site is not expected to experience significant change or deterioration from operation of the proposed plant.

Effects of Plant Operation on Aquatic Life

Some Ohio River fish and benthic organisms will be lost through impingement on the water intake structure screens or entrainment in the water system of the proposed Trimble County Generating Plant. Recent studies have shown that, in this sector of the Ohio River, entrainable fishes and benthic organisms are relatively sparse and impingement/entrainment effects usually insignificant (Dames & Moore, 1976a, b, c). Furthermore, intake structure design, velocity, and placement (see Sections 3.4.3 and 4.3.2) should eliminate heavy mortalities of fishes and benthic communities.

Certain nektonic (free swimming) species may concentrate in the thermal plume area. However, because temperature variations between the thermal plume and ambient river water will be small, significant increases in the amount of organisms present will not occur in the plume area.

Effects of Atmospheric Emissions on Aquatic Life

The proposed Trimble County Generating Plant flue gases and cooling tower emissions (SO_2, NO_2, particulates, salt drift) may affect the

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surrounding aquatic ecosystem. However, the amounts of these emissions entering the surface waters will be small; therefore, even though this action will be long-term, it should not significantly reduce water quality nor reduce the quantity or diversity of aquatic life (which is already low in this area).

Effects of Solid Waste Handling and Disposal

Effect on Surface Water Quantity

Some of the water that collects behind the dams in the offsite disposal ravines will be lost to evaporation.

Effect on Ground Water Quantity

Ground water recharge from leakage along the valley walls of Ravines RA and RB will be reduced or eliminated by development of these ravines as solid waste disposal areas. However, the net effect is considered to be insignificant because the volume of recharge to the alluvial aquifer beneath the site that can be attributed to surface infiltration is small, relative to recharge from the Ohio River.

Effect on Surface Water Quality

Because runoff from the solid waste disposal areas and onsite pond will be controlled and, in the case of Ravines RA and RB, monitored before discharge or reuse (see Section 4.2.5), no detrimental impact is anticipated. However, if breaching of the containing dikes should occur, significant short-term deterioration of the waters (Corn Creek, Ohio River) that would receive the runoff possibly could occur, resulting in a serious health hazard. Contaminants likely to enter the receiving waters in excessive amounts would be soluble trace metals (lead, zinc, etc.), dissolved and suspended solids, sulfates, chloride, calcium, and magnesium.

Effect on Ground Water Quality

The quality of the glacial outwash aquifer underlying the proposed Trimble County Generating Plant site is not expected to be harmed by solid waste disposal activities. However, this aquifer is a major natural resource that must be protected from plant-related contaminants.

In order to prevent contamination from solid waste disposal, waste materials (fly ash and scrubber sludge) will be mixed with a chemical fixation agent that is expected to render the material stable, impermeable, and nonleachable.

The chemically and physically stabilized solid waste materials will be contained in two ravines, RA and RB. Ordovician and Silurian bedrock strata underlie a residual or colluvial soil in both ravines. Although the Ordovician bedrock is very low in permeability and offers an excellent natural containment for the solid waste fill, two principal contamination routes to the glacial outwash aquifer are available:

1. Sub-flow beneath the mouth of both ravines where ground water enters the glacial outwash aquifer as leakage along the ravine bottom and the valley wall

2. Local reversal of ground water flow in the karstic Silurian strata as the solid waste fill operations progress above the contact elevation (approximately 730 to 750 feet); any contamination that enters the complex Silurian limestone aquifer will ultimately enter the glacial outwash aquifer by leakage along the valley wall from contact springs along the bluff

Neither of these two potential problems will materialize provided that the solid waste material can be stabilized according to the present plan. If, however, the solid waste cannot be made totally stable and nonleachable by the time of plant start-up, then a system of engineered containment will be used to prevent ground water pollution by either of these mechanisms. Sub-flow at the mouth of both ravines may be controlled by placement of a permeable drain blanket beneath the solid waste fill. A clay-cored barrier dike may be placed at the mouth of each ravine to collect seepage water from the upstream blanket underdrain. The seepage water may then be treated, if necessary, but would not be allowed to enter the glacial outwash aquifer directly. In addition to the drain blanket, a clay liner may be used in the higher portions of the ravine fills to prevent the infiltration of seepage into the Silurian limestone aquifer. The extent and design of these and other engineered safeguards will be incorporated into the final design plans after the solid waste stabilization study and the site geology have been fully evaluated. Provided that the solid waste materials can be stabilized as effectively as assumed, then none of the available engineered safeguards may be necessary in either ravine.

Effect on Aquatic Life

Should leakage or breakage of the containing dikes occur, and the water contained in the onsite disposal pond or the ravines enter Corn Creek or the Ohio River, large quantities of fishes, plankton, and benthic organisms, if present in the area, could be destroyed.

Effects of Fuel and Reactant Handling and Storage

Effect on Surface Water Quality

Because runoff from the coal and limestone storage areas will be collected and treated, if necessary, before it is released to the Ohio River (see Section 4.3), no harmful effects on the river's water quality are anticipated.

However, accidental spillage or seepage of fuel oils, coal, limestone, or sulfuric acid into the river during unloading could result in deterioration of the river's water quality. The significance of the deterioration would depend on the amount and duration of the spill or leak. Oil and sulfuric acid would have the most adverse effect on water quality by altering the pH of the water and introducing toxic substances.

Measures that will mitigate the effect of such accidental spills, should they occur, are described in Section 7.0.

Effect on Ground Water Quality

Because the coal and reactant will be stored in areas lined with an impervious material (probably clay), no impact from fuel and reactant handling and storage is anticipated. This and additional measures designed to protect ground water from contamination are described in Section 7.0.

Effect on Aquatic Life

Accidental spillage of oil, sulfuric acid, coal, or limestone could seriously affect aquatic life in the Ohio River. Depending on the time and nature of spillage and its duration, these impacts could be either long- or short-term. Accidental spillage of fuel oil and sulfuric acid would result in the greatest damage to the aquatic system near the plant site, causing movement of adult fish population from the area, destruction of fixed macrobenthic and periphyton populations, reduction of phytoplankton populations, and a general reduction in the stability and community structure of the ecosystem.

Effects of Additional Barge Traffic

Effect on Ohio River Water Quantity

The tows carrying coal to the proposed Trimble County Generating Plant will cause an increase in lockage at the Cannelton and McAlpine Locks (see Section 6.1.4). Each additional lockage requires approximately 130 acre-feet of water (U.S. Army, 1968). However, the total water use for lockage at maximum capacity at the McAlpine and Cannelton Locks is much less (approximately one-third) than the minimum low flow in the river (U.S. Army, 1968). If the water is not passed through the locks, it must be passed through the dam. Thus, the increase in lockage resulting from the proposed Trimble County Generating Plant will be of no consequence as far as water quantity is concerned.

Effect on Ohio River Water Quality

As a tow makes its way along the river, it generates waves, and, if the water is not very deep, sediments in the river bed are resuspended into the flow. Along the riverbank at the proposed Trimble County Generating Plant site, there is a small beach at the normal pool elevation of 420 feet. This beach was developed by wave action. Fast-travelling recreational boats generate the largest waves; heavily loaded tows travelling in shallow water with a silty bed generate the most turbidity.

Because the average additional barge traffic resulting from the facility will be only about 10 barge tows per week, waves from this traffic will add only slightly to the turbidity and shoreline erosion of the Ohio River.

The turbidity generated by the additional tows could be appreciable during low flow periods if the loaded tows travel upstream in the shallow slackwater. Empty tows travelling downstream in the deep, fast water will not generate nearly as much turbidity. However, the river is regularly dredged for sand and gravel, as well as for channel maintenance. Thus, although the turbidity generated by the additional traffic will add to the present turbidity in the Ohio River, the addition will not be greater than that regularly generated by the sand and gravel dredges. Further, the Ohio River generally has a high background turbidity.

Spills on the Ohio River mainstem are common and are increasing. For example, the Ohio River Valley Water Sanitation Commission's Twenty-First Yearbook, 1969 reported 11 spills of oil and other petroleum products in 1969. The causes of the spills included accidental damage to a barge, failure of a lagoon, operations at petroleum processing plants (2), and operations at transfer stations (7). By 1973, the number of accidental spills of oil or chemicals reported in the ORSANCO Yearbook, 1973 had increased to 40. Increased accidental spills are assumed to rise with increased traffic levels. Thus, the additional barge traffic resulting from the proposed project raises the potential for accidental spills on the Ohio River.

A barge spill of materials such as fuel oil or sulfuric acid would result in significant water quality deterioration (see Effects of Fuel and Reactant Handling and Storage).

Effect on Aquatic Life

The increased barge traffic with its resultant increased turbidity, resuspension of bottom sediments, and increased wave action may generally lower biotic productivity in the nearshore areas (see Section 6.1.3).

A barge spill of materials such as fuel oil or sulfuric acid would have a significant impact on the aquatic life of the area. The effects of a barge spill of this nature would be short-term, but much aquatic life probably would be destroyed.

Effects of Plant on Flooding

The proposed project will have an insignificant effect on flood levels in the Ohio River.

6.3.4 People

Operation of the proposed Trimble County Generating Plant will result in beneficial as well as adverse primary impacts on the people of the area. Primary beneficial effects will include new employment opportunities and the wages paid to plant personnel. Primary adverse effects may result from increased demands for housing, social services, and other amenities. Increases in the general level of activity in the local area, accompanied by increased noise levels, will also occur, although these will be simultaneous with construction impacts for the first 9 years of plant operation. The more significant effects resulting from plant operation are discussed in the following subsections. However, before proceeding, it is necessary to delineate those areas that will be affected most significantly by the operation of the plant.

In general, the delineation of the impact area requires an assessment of the proposed plant's operating work force and payroll, the requirements for goods and services generated by the plant, and the expected life of the plant. All of these factors are weighed against the ability of the surrounding area to provide and/or accommodate the plant labor force and to supply the required goods and services during the planned 30-year life of the plant.

The proposed Trimble County Generating Plant is located in a rural setting: the area is sparsely populated, and there are no nearby communities of significant size. Housing availability is low; there are few urban amenities; and the county school system is currently operating near capacity. Few of the skilled workers necessary to operate the plant are available in Trimble County. This will necessitate that: (1) local workers hired to work in the plant be trained; (2) skilled workers relocate to the project area; or (3) skilled workers commute to the plant on a daily basis from more distant locations. Present plans call for some local and nearby laborers to be trained for skilled jobs at the plant, although relatively few of these individuals could be completely integrated into the work force until the second and ensuing units are brought on line.

Many of the goods and services required for plant operation will necessarily be imported from the larger regional cities (e.g., Louisville) because they cannot be obtained at the local level.

The result of these conditions is that many of the plant effects will be relatively widely distributed. Because of this, three impact areas have been selected: (1) a "local" area, which is defined as Trimble County; (2) an "intermediate" area, which is defined as Trimble, Carroll, Oldham, and Jefferson Counties, Kentucky, and Jefferson County, Indiana; and (3) a "regional" area, which is loosely defined as the state of Kentucky.

Trimble County was selected as the local impact area because it will be the focus of plant operations. Plant activity, noise, numerous relocations, increased demands for local services, expenditures, and property tax revenues (discussed in Section 6.4.4) will be concentrated in the county.

The five-county intermediate area was selected because it is likely that most of the plant's operating personnel will be drawn from this area. It is unlikely that a significant number of personnel would be drawn from other counties because of the commuting distance involved. Furthermore, with the exception of Trimble County, the other "intermediate" counties are more likely than the more rural counties surrounding the intermediate counties to contain a greater number of labor skills that could be readily utilized at the plant.

Kentucky is defined as the regional area because most plant personnel, goods and services, and tax revenues will be generated in the state. It is recognized that some benefits will accrue to Indiana and other states, but these are expected to be relatively small. For example, the most significant benefit to Indiana will be the employment of some laborers from the Madison/Jefferson County areas. However, a review of the availability of labor skills in that portion of Indiana from which plant operators could be drawn indicates a projected shortage of the particular skills that would be required at the plant (State of Indiana, 1977).

Effect on Population

The operating staff of the proposed plant will be assembled beginning in 1983 when the first unit is projected to come on line. As indicated in Table 6.3.4-1, Units 2, 3, and 4 are projected to come on line at 2-year intervals beginning in 1985, and the full compliment of 350 operating personnel will be reached in 1989 upon completion of the fourth unit. It is anticipated that all of the Unit 1 plant supervisory and administrative personnel and approximately 60 lower level staff personnel will be transferred to the new plant from other of the Applicant's operations. Present plans indicate that by the time Unit 2 comes on line, the lower level staff personnel will be ready to assume the upper level manangement positions.

TABLE 6.3.4-1

OPERATION PERSONNEL - PERCENT OF COUNTY POPULATION AND TOTAL ANNUAL PAYROLL TRIMBLE COUNTY GENERATING PLANT

	Personnel	Percent of County Population	Annual Payroll[a] ($000's)
Unit 1			
1983	226	3.8	$ 4,362
1984	226	3.8	4,602
Unit 2			
1985	264	4.3	5,672
1986	264	4.3	5,984
Unit 3			
1987	306	5.0	7,318
1988	306	4.9	7,720
Unit 4			
1989	350	5.6	9,316
Total			$44,974

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[a] 1977 dollars, escalated at an annual rate of 5.5 percent, and based on a yearly salary of $14,000.

Many of the personnel who will be permanently transferred to the Trimble County plant may choose to relocate to the project area if their commuting time to the plant exceeds 30 to 45 minutes. Most of these employees would be coming from the Metropolitan Louisville area. It is estimated that approximately 30 of the 120 employees transferred from other Applicant-owned operations and 30 other "new hires" will relocate to the local area. This estimate is based primarily on projected local school capacities and housing availability, which is expected to expand in response to increased economic stimulus in the county resulting from construction of the plant. The balance of the initial, 260-person operating labor force will be drawn from the intermediate impact area. As Units 2, 3, and 4 come on line between 1985 and 1989, the relocation patterns will vary depending on the expansion of services in Trimble County. Some "new hires" may choose to relocate closer to the plant but may choose to live in Carrollton, Madison (Indiana), or northeastern Metropolitan Louisville due to a greater availability of urban amenities.

By 1989, when the fourth unit is brought on line, it is estimated--based on "long-term" school capacity projections--that up to 190 operating personnel could have relocated to the county. If each of the 190 personnel relocating to Trimble County brings a family (estimated to have 3.57 members per family--the 1970 Kentucky average), then the population of the county will increase by 678, or approximately 11 percent more than the county's 1989 projected population of 6,292[a].

It is likely that many of these families will locate in Bedford, to settle as near their jobs as possible, although there are no overriding considerations for settling in the community (e.g., no zoning regulations, no public sewerage system, a unified county school district). If most of the operating personnel would choose to settle in Bedford, the population of the community (presently at 754) would nearly double. In any case, the operating personnel and their families will be integrated into the local area over a 6-year period, thereby allowing for planning by county officials. If additional relocations to Carrollton, Madison, and northeastern Metropolitan Louisville occur, the impact would be small due to the relative size and larger population of these areas.

Wages of Personnel

Beginning in 1983, the operating staff for the proposed Trimble County Generating Plant will be a source of income for the project region. A summary of the total wages earned by the operating personnel over the 6-year period during which the four units come on line is presented in Table 6.3.4-1. As indicated in Table 6.3.4-1, the total payroll for this period will be slightly less than $45 million. Over the life of the project, the Applicant will spend approximately $696 million on wages for operating personnel. These figures are based on an annual average salary of $14,000 (1977 dollars) and escalated at a rate of 5.5 percent per annum for each of the 350 employees during the 30-year operation period.

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[a] Assumes an annual growth rate of 0.9 percent

Of the $45 million earned by the operating personnel between 1983 and 1989, an estimated $31.5 million would constitute disposable income. Of the total estimated payroll of $696 million, approximately $487 million would constitute disposable income. It is estimated, given the projected residential patterns of the plant employees and the availability of goods and services in northwest Kentucky, that most of these monies will be spent in the five-county intermediate impact area.

Effect of Income

Because of the generally rural character of Trimble County, the most significant effects of new income will probably be experienced in this county. In 1970, the median family income in the county was $6,596 (Commonwealth of Kentucky, 1975). By 1973, total personal income was $17.8 million, indicating that the average per capita income was $3,339 (Commonwealth of Kentucky, 1975). Assuming that a maximum of 190 operating personnel relocate to Trimble County by 1989, total new, gross income in the county from plant wages would then be approximately $5 million. This would constitute approximately 12 percent of total earned income in the county, assuming that the 1973 total income escalates at an average rate of 5.5 percent per year to 1989. While the expenditure of employee wages in areas other than Trimble County will constitute an economic benefit, the detection of this effect in a more populated and economically developed area (e.g., Carrollton, Madison) will be more difficult. The indirect effects of payroll disbursements are discussed in Section 6.4.4.

Effect on Housing

The most significant impact on housing will be experienced in Trimble County. Additional housing capacity would be expected in Carrollton, Madison, and the northeastern Metropolitan Louisville area by 1983, due to their relative sizes and ability to respond more readily to economic stimulus. Housing capacity in Trimble County, however, without the proposed plant, is projected to remain low. According to a recent report supervised by the Kentucky Housing Corporation, there were 1,696 occupied year-round housing units in Trimble County in 1970 (University of Louisville, 1974). Of these, 506 were classified as substandard units. The total vacancy ratio was 0.2 percent for "for sale" structures and 1.7 percent for "for rent" structures. By 1980, without the project, there will be a cumulative housing need for 779 units (University of Louisville, 1974). According to the Trimble County Tax Assessor's Office, there are currently an average of 50 new housing starts per annum in the county. Most of these new houses are started by existing county residents. This shortage and the accompanying high percentage of substandard housing could pose serious problems for workers desiring to relocate in the county. However, due to the long-term commitment of plant employment, this shortage should not result in the "quick" construction of unsightly housing and numerous mobile homes. The relative abundance of satisfactory housing in other areas (e.g., Metropolitan Louisville) could accommodate the excess demand, although at the inconvenience of plant laborers who would have to commute to the site. Workers desiring to live in the county could have homes constructed.

It is reasonable to assume that a new-housing construction cycle will begin in the county (probably near Bedford) in order to meet the demands of plant personnel and their families. This construction cycle will probably begin during the plant construction phase, as a result of economic stimulus in the county. If 190 operating personnel ultimately relocate to the county, then up to 190 new homes could be constructed in the county as a direct result of plant operations. However, it is likely that the actual number of new housing starts will be less than this due to the departure of most of the construction labor force by 1989.

A new housing construction cycle will reduce the average age of the housing in the county, raise the median value of houses, and probably create serious requirements for water, sewerage disposal, and other service facilities. The cost of the required services will be largely offset by revenues derived from the facility and its personnel. However, unless proper planning is undertaken by the county at an early date, a lag period will develop between the initial demand and the time the services can be provided, resulting in a temporary reduction in the county's ability to provide adequate services.

Effect on Schools

The relocation of approximately 60 operating personnel and their families to Trimble County by 1983 could become the potentially most severe impact of plant operations. The county schools are presently operating near capacity, and local residents have recently voted against a bond issue which would allow for the construction of a new facility. However, plans have been made for a new 300-student elementary school, and funds may be forthcoming from the government to assist in the program. According to the Superintendent of Trimble County Schools, approximately 100 plant-induced enrollments could be accommodated in the existing system, assuming an even grade distribution and providing that several teacher's assistants could be hired (May, 1977). If the new 300-student elementary school is constructed by 1989, as many as 190 plant laborers could theoretically relocate to the county without significant school overcrowding, assuming that an average of 1.57 school-aged dependents accompanies each employee.

It is recognized that the school capacities could be reduced by additional enrollments resulting from construction personnel relocating to the county with their families. However, the duration of construction employment will be significantly less than operations employment, and by the time the full complement of 350 operating personnel is reached in 1989, most of the construction employees will have departed from the project area. Therefore, while an "overlap" of school enrollments may result in temporary overcrowding and require short-term alternate facilities, this is not expected to create a long-term problem.

Assuming that the normal population growth in the county is 0.9 percent a year, and that the age composition of the population will not change significantly, Trimble County school enrollment should be approximately 1,374 students by 1983. If 60 operating personnel relocate to the county during 1983, the 94 school-aged dependents placed in the school system could account for an enrollment increase of approximately 7 percent. If, by 1989, 190 plant employees relocate to the county and approximately 300 plant-induced students are enrolled in the school system, an enrollment increase of approximately 21 percent over the projected 1989 enrollment could occur.

It must be emphasized that, in considering the time frame for plant start-up, any one of numerous developments could alter the school enrollment figures presented above. However, it is reasonable to assume that increased tax revenues derived from the plant and its operating personnel will largely offset the cost of providing expanded school services. Also, if large numbers of plant-induced enrollments occur, new teachers will have to be hired to maintain the existing student-to-teacher ratio. Based on the enrollment figures presented above, plant operation could result in the need for three additional teachers by 1983 and 11 by 1989. Careful planning on the part of school and county officials, and a close liaison between local officials and the Applicant, could go far to mitigate adverse impacts on the school system.

Enrollment increases in the nearby communities of Carrollton, Madison, and northeastern Metropolitan Louisville resulting from plant operation will be relatively small. It is unlikely that these increases will create significant problems.

Effect of Noise Emissions

Noise levels at the proposed Trimble County Generating Plant site are expected to increase during operation of the plant. Analysis of results from the onsite ambient noise survey and data from post-operational noise measurements at 26 coal-fired plants indicate that the increase in boundary noise levels should be minimal for normal operating conditions. The major sources of noise associated with operation of the facility include:

Air compressors
Air handling equipment
Atmosphere vents (air and steam)
Barge unloading facilities
Coal handling equipment
Diesel generators
Fans (induced and forced draft)
Motors
Natural draft cooling towers
Precipitator rappers
Pumps
SO_2 removal equipment
Switchyard
High pressure values

Noises from the above sources will be both intermittent and continuous. Variables such as plant capacity and loading, type and location of equipment, and the degree to which enclosures and silencers are used to muffle equipment noise affect the levels of noise produced by a power plant. It is, therefore, difficult to predict the noise level of a plant prior to its construction.

Typical octave band sound pressure level spectra for a 500- to 1,500-MW power plant and a natural draft cooling tower measured at 2,500 feet and 1,400 feet, respectively, are shown in Figures 6.3.4-1 and 6.3.4-2. The decibel A-weighted (dBA) sound levels measured at 2,500 feet from a power plant range from 37 dBA to 52 dBA. For a natural draft cooling tower, A-weighted sound levels range from 46 dBA to 52 dBA measured at 1,400 feet.

Table 6.3.4-2 shows the approximate maximum daytime and nighttime ambient noise levels measured at the Trimble County Generating Plant site, the distances between the monitoring locations (see Section 5.1.3) and the plant and cooling towers, and the estimated expected noise levels from plant operation at these locations. Actual sound levels should be lower. First, the upper level of typical plant and cooling tower noise emissions was used to estimate these sound levels. Second, noise attenuates at the rate of 6 dBA when the distance from the source is doubled. It is expected that noise attenuation at the Trimble County Generating Plant site will exceed the normal 6 dBA decrease due to noise absorption by the berm along the south end of the plant, vegetation, ground cover, and the bluffs. Also, other structures at the plant will absorb some of the noise emitted. Third, the Applicant intends to use measures to reduce some of the sound emissions from the plant (see Section 7.0).

Location X-3 (see Section 5.1.3, Figure 5.1.3-1) is the only location at which the expected noise level far exceeds the ambient noise level. This is caused by the proximity of X-3 to the plant. The increase in the noise level at this location is not of major concern because of its distance from the nearest residence. The exposure to noise levels at this location would affect someone passing the site by boat and would be of short duration.

Health Effects of Air Pollution

As noted in Section 5.1.2, air quality standards have been established to provide a reasonable margin of safety against the potential adverse effects of pollutants on human health.

The principal pollutants emitted by fossil-fueled power plants--SO_2, particulates, and NO_x--are irritants to the respiratory system when present in sufficient concentrations. They present the greatest hazard to the elderly or those with respiratory ailments (asthma, emphysema, bronchitis) or cardiovascular disease.

The effects of high levels of SO_2, the effluent of most concern, may not be nearly as harmful alone as when high levels of both SO_2 and particulates are present. The synergistic effects of these two pollutants may be attributable to the behavior of fine particulates (less than 2 μ) that cannot be filtered by the respiratory system and hence may become embedded deep in the lungs where they may reside for long periods. Because these particulates may absorb sulfur oxides, they provide a convenient mechanism for transporting sulfur oxides into the lungs. In general, exposure for a 2-year or longer period to annual average SO_2 concentrations greater than 90 $\mu g/m^3$, when in conjunction with particulate concentrations greater than 80 $\mu g/m^3$ and suspended sulfate concentrations greater than 12 $\mu g/m^3$, has resulted in statistically significant increases in morbidity from respiratory disease (U.S. Environmental Protection Agency, 1974a). Children have been found to be susceptible to suspended sulfate concentrations lower than those to which adults are susceptible. As mentioned previously, the impact of increased sulfate concentrations cannot be adequately assessed because accurate technology to determine its rate of formation and distribution has not been developed at this time.

The odor threshold of NO_2 is approximately 2,000 $\mu g/m^3$, with eye and nasal irritation noted at levels above 26,000 $\mu g/m^3$. These concentrations are not likely to be encountered from plant operation under normal conditions.

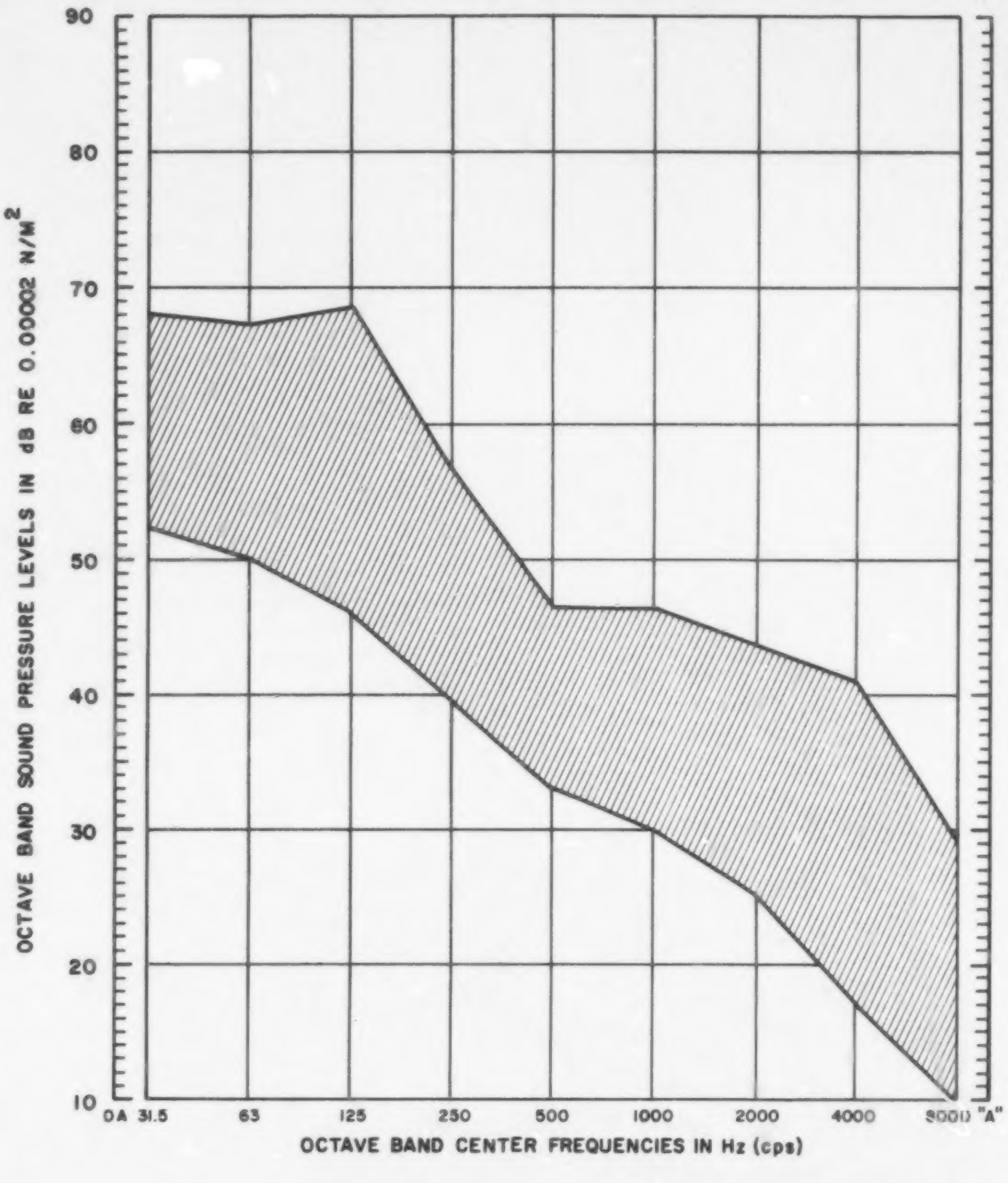
Ground-level concentrations of plant contaminants will be below the air quality primary standards for SO_2, total suspended particulates, and NO_2 during full load operation of the proposed plant; these standards are designed to protect the health of individuals breathing air affected by industrial emissions.

Effect of Additional Barge Traffic

The 6 million tons of coal and the 1,106,000 tons of limestone anticipated to be consumed per year by the proposed plant will require the passage on the river of 4,737 full barges and 4,737 empty barges. This will require the locking of 632 additional barge tows per year, or an average of 1.7 additional barge tows per day through the McAlpine and Cannelton Locks. Section 6.1.4 discusses the relationship of project barge traffic to the capacity of the McAlpine and Cannelton Locks and Dam. Waiting time at the locks is not expected to be significantly lengthened by the additional traffic caused by the project.

According to the Corps of Engineers, dredging operations are required more often at the smaller locks than at the larger locks. Because the barge tows for the proposed Trimble County Generating Plant will use only the larger locks, it is unlikely that dredging operations would be hampered. If the larger locks require dredging for some reason, only the lower approach will be dredged. The dredging of the lower approach would require about 1 month to complete, and some delay to river barge traffic would be anticipated (U.S. Army, 1975a).

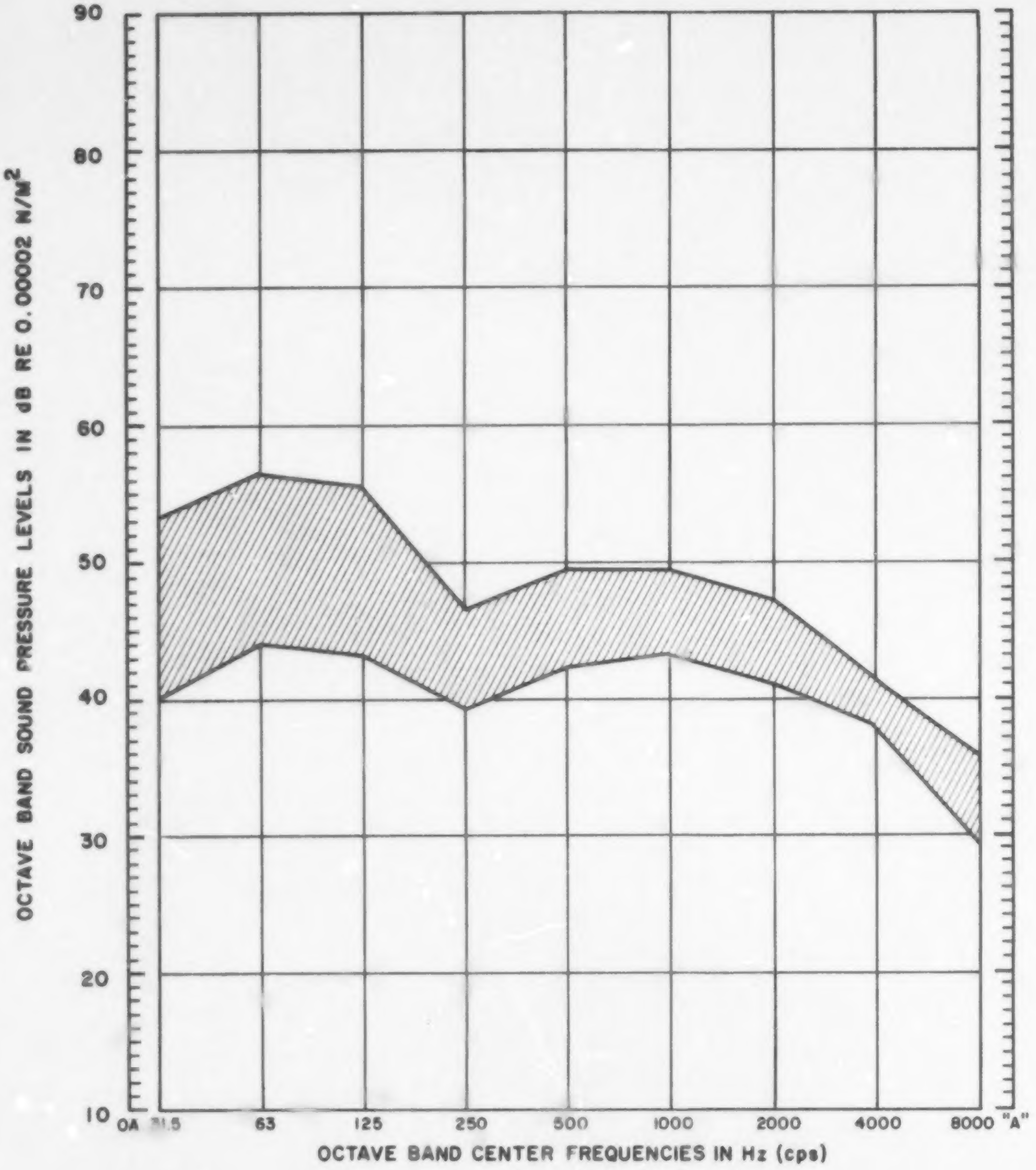
Recreational boating along the proposed Trimble County Generating Plant barge traffic route will not be affected by the additional barge traffic either at the locks or on the river itself. According to the Corps of Engineers, the recreational boat traffic is aware of the present commercial barge traffic and has not encountered significant problems in this respect. The additional barge traffic will not affect waiting times at the locks for recreational boating, because recreational boating is encouraged to use the smaller locks and leave the larger locks open for the barge tows (U.S. Army, 1975a).



LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

POWER PLANT SPECTRA,
TYPICAL RANGE FOR
500 TO 1500 MW PLANTS
AT 2500 FEET

FIGURE 6.3.4-1



LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

RANGE OF NATURAL DRAFT
COOLING AT 1400 FEET

FIGURE 6.3.4-2

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TABLE 6.3.4-2

ESTIMATED NOISE LEVELS (dBA) AT THE BASELINE MONITORING LOCATIONS WITH BOTH PLANT AND COOLING TOWERS IN OPERATION TRIMBLE COUNTY GENERATING PLANT

	Location[a]						
	X-1	X-2	X-3	X-4	X-5	P_X-1	P_X-2
Approximate daytime sound level (L90) (dBA) 0700-2200	37	32	33	32	39	26	38
Approximate nighttime sound level (L90) (dBA) 2200-0700	41	42	32	28	45	27	36
Distance to plant (feet)	6,675	2,000	600	1,900	1,900	2,600	2,800
Distance to cooling tower (feet)	6,000	1,050	750	2,850	2,700	1,650	3,600
Estimated maximum resultant noise level, daytime (dBA)	44	58	65	55	55	55	52
Estimated maximum resultant noise level, nighttime (dBA)	46	58	65	55	55	55	52

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[a] See Figure 5.1.3-1

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There have been three major accidents since March 19, 1972 on the 981 miles of the Ohio River from Pittsburgh, Pennsylvania to Cairo, Illinois. Two of the accidents were a result of barge misalignment with the locks. None of these accidents was a result of contact of a barge with other barge tows or recreational boat traffic. However, the anticipated increase in barge traffic will slightly increase the chances of accidents in the stretch of the river over which the coal and limestone are shipped.

Effect of Transmission Facilities

Effect on Flora and Fauna

Vegetation will continue to be eliminated from the corridor through herbicide spray applications to control woody plant growth. This impact is judged to be minor (1) because of the impact of construction activities in clearing and altering the vegetative composition of the transmission corridor and (2) because spraying activities are conducted only every 5 to 7 years.

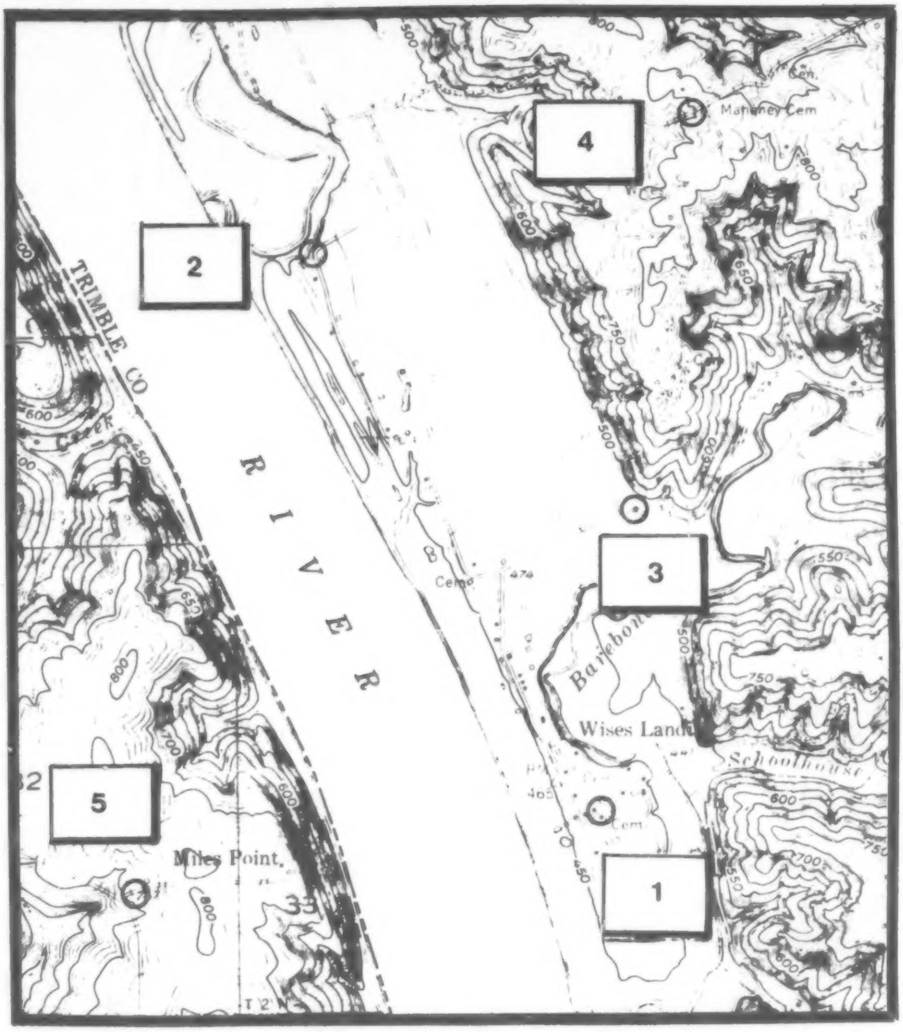
The periodic reduction of transmission line right-of-way vegetation will affect the wildlife carrying capacity of the right-of-way and temporarily reduce the quality of its wildlife habitat.

During periods of limited visibility, migratory birds could collide with the transmission line towers. Because the Ohio River forms a migratory path, it is conceivable that birds could fly into the tower structures at dawn, dusk, after dark, or during foggy or otherwise inclement weather. Bird losses as the result of such tower collisions, if they occur at all, are likely to be very small.

Radio and Television Interference

The environmental impact of coronal discharge from the transmission lines will depend on conditions prior to the line construction and the level of noise emanating from the energized line. High-quality radio or TV reception is a product of either a high signal strength or a low background noise level. Radio interference or television interference resulting from transmission line corona depends on the ratio of received signal strength and the noise level produced by the line. This is the interference signal-to-noise ratio (SNR) (Byron, 1974). Industry data and the Federal Communications Commission have determined that a SNR of 24 dB will assure good quality radio reception (Byron, 1974; Shah, 1974).

Field surveys have been made to determine existing radio strengths at five different locations in the vicinity of the plant site. The five survey testing locations are shown in Figure 6.3.4-3. Survey results have shown that the existing radio signal strengths range from 40 dB to 85 dB for 26 different stations.


4
Mahoney Cem
2
TRIMBLE CO
Creek
RIVER
Cem
474
3
Barebone
Wises Landing
Schoolhouse
405
Cem
1
5
Miles Point
33
500
550
600
650
700
750
800

DATE	**FLUOR PIONEER INC.**	STANDARD DETAIL
	RADIO STRENGTH TEST LOCATIONS	FIG. 6.3.4-3

FORM C-312 10/74

Figure 6.3.4-4 is a graphic representation of the estimated fair-weather and foul-weather radio interference (RI). The RI from the transmission line at a point immediately below the conductors is 38 dB during fair weather and 52 dB during foul weather. The RI from the transmission line at the edge of the right-of-way, a distance of approximately 200 feet, is 25 dB during fair weather and 38 dB during foul weather. Figure 6.3.4-4 also shows that RI at a distance of 320 feet from the centerline of the right-of-way will be 15 dB in fair weather and 30 dB in foul weather.

Analysis of the above information indicates that only 9 of the 26 stations picked up by a radio receiver located at the edge of the right-of-way during fair weather will have a noticeable degradation of reception. During foul weather, a radio receiver in the same location will have a noticeable degradation of reception on 22 of the 26 stations.

The distance from the transmission lines to the residence nearest the plant site and Kentucky transmission lines is 1,200 feet; thus, RI from these lines should not affect the radio reception of local residents. Because the exact location of the Indiana transmission line has not been determined, the number of individuals likely to be affected cannot be determined.

Television interference (TVI) from transmission lines can be produced either by complete electrical discharges across small gaps, known as gap-type sources, or by corona. Practically all fair-weather power line TVI is caused by gap-type sources, which can easily be prevented or eliminated by following good construction practices (Lotners, 1974). Corona during positive half-cycles can produce a measurable type of TVI known as "precipitation TVI" when there is precipitation on conductors resulting from rain or snow (Shah, 1974). Transmission lines will be designed to minimize RI, and this, in turn, will automatically reduce precipitation-type TVI.

The evaluation of the effect of TVI from transmission lines is the same as that of RI, except that for TVI, the performance criterion is video reception. A signal-to-noise ratio of 40 dB for excellent TV reception and 17 dB for tolerable reception has been established (Clark and Lotners, 1970). Because the distance from the transmission line to the nearest residence is approximately 1,200 feet, TVI is not expected to affect TV reception in the Wises Landing area.

Noise Emission

Audible noise emission, resulting from the superposition of crackling noises, is produced when electrons drift away from the surface conductor. The audible noise emission from transmission lines is a wet conductor phenomenon and should not occur during fair weather, except at very high surface gradients. During foul weather conditions, especially fog and heavy rain, water droplets formed under the conductor are stressed electrically. When these droplets leave the conductor surface, a humming and

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crackling noise emanates from the transmission line. Thus, for a given line design, foul weather audible noise emission depends on surface condition, precipitation on conductors, and wind velocity (Shah, 1974).

The transmission lines will be designed and constructed in such a manner that the fair weather audible noise at a distance of 50 feet from the centerline of the right-of-way will be zero.

Ozone Emissions

Recent studies have shown that no measurable amounts of ozone (less than 2 ppb) are formed as a result of the presence and operation of transmission lines carrying up to 765 kV (Fryman and Miller, 1973). No adverse effect on vegetation or animals has been found to occur even during foul weather when the heaviest corona discharge occurs (Scherer, et al., 1973). The National Primary Air Quality Standard for photochemical oxidants such as ozone, as issued by the Environmental Protection Agency, is 80 ppb (by volume) for the maximum arithmetic mean for a 1-hour concentration, not to be exceeded more than once a year.

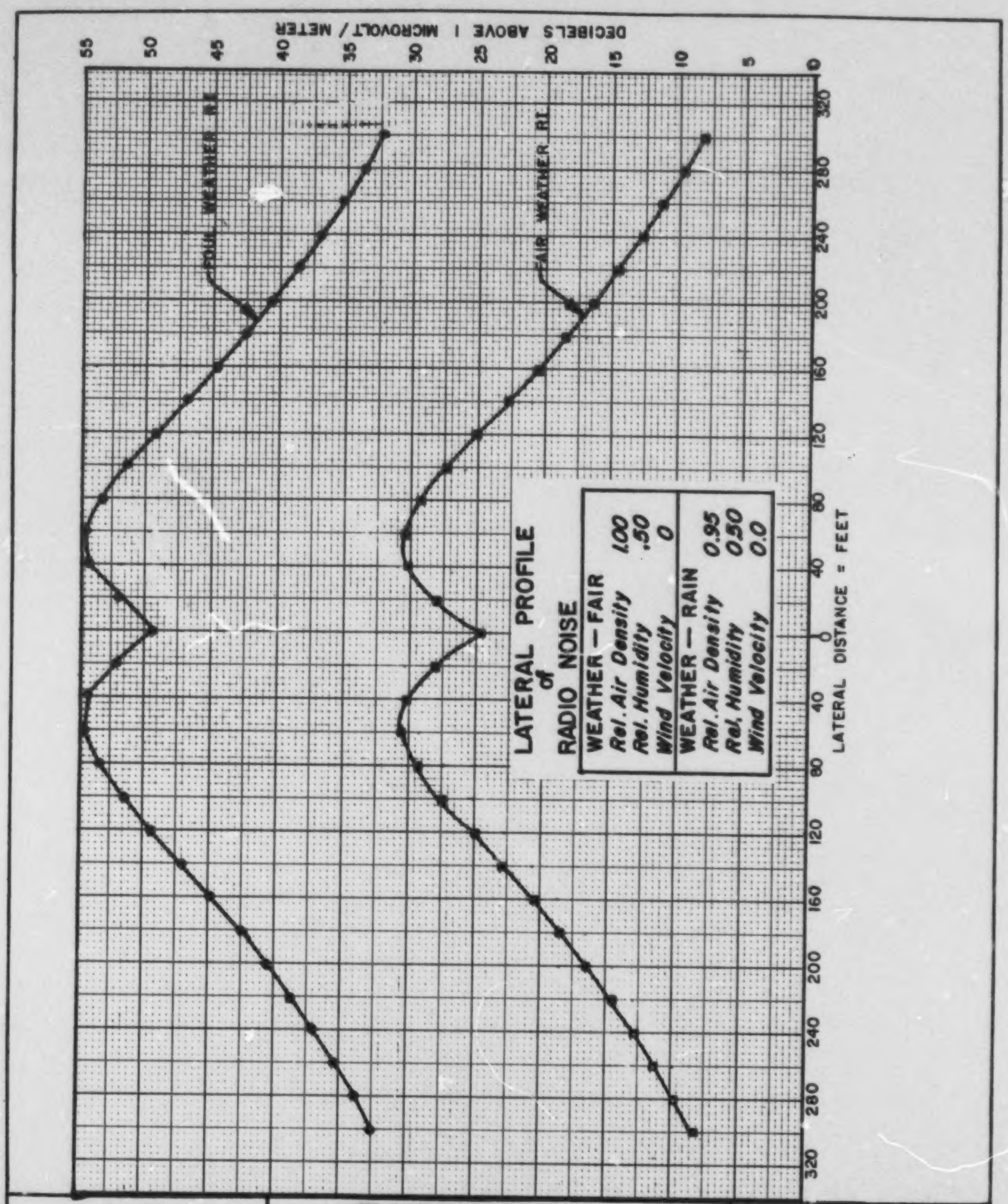
Visual Effects of Proposed Plant

The proposed facility will be in full view of persons travelling along relocated County Road 1488. The view from the Ohio River will be dominated by the barge docking and unloading facilities, with associated barges in the foreground. The plant structures will be visible in the background against the wooded slopes at the east edge of the site.

Structures will be grouped in a compact site arrangement to avoid the appearance of industrial sprawl. Ground cover on the onsite pond dikes and tree plantings on the south berm will help to blend the developed areas with the natural vegetation background provided by the wooded slopes.

Because of their rise above the topography, visible plumes from the cooling towers and chimneys will be seen at greater distances than any plant structures. The predicted frequency and extent of visible plumes are discussed in Section 6.3.1. At times, the white, moisture-laden plumes may blend with natural cloud formations, or rise above low clouds, and present no distinct visual effect. At other times, the plumes will be very distinct. The visual impact of the plant structures themselves is discussed in Section 6.1.4.

The proposed plant will be out of character with the otherwise rural setting of the surrounding areas. Further, the cooling towers, chimneys, and onsite pond dikes will be out of proportion to other structures in the area and in sharp contrast to the flat land on which they are built, although the hills surrounding the plant will lessen this degree of difference. Because there will be no roads other than CR 1488 from which a direct view of the plant will be available (the only other major vantage point being the Ohio River); the number of people exposed to the total visual impact of the plant will be small.



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FLUOR PIONEER INC.

STANDARD DETAIL

FIG.

6.3.4-4

FAIR & FOUL WEATHER RI

FORM C-312 10/74

6.4 SECONDARY OPERATION IMPACTS

6.4.1 Effects of Atmospheric Emissions

Significant Deterioration

Perhaps the single most important secondary effect of plant operation with respect to atmospheric emissions is the proportion of maximum allowable air quality significant deterioration increment used up at any given geographical location. As stated in Section 5.1.2, the contribution of sulfur dioxide (SO_2) and particulates from a new source or sources cannot exceed the given limits. The proposed Trimble County plant, being the first new source in the area required to conform to these regulations, will, at some locations, use a large portion of the allowable increment. Since these increases are subtractive (i.e., a second new source will be permitted to use only the difference between the maximum increment and the amount used by the Trimble County plant, the location and emission characteristics of potential new sources will be restricted, based on the extent of the Trimble County plant's influence. This zone of influence has been established by plotting isopleths (Figures 6.4.1-1 through 6.4.1-5) of the percentage of significant deterioration increments for various pollutants and time periods used by the plant. Estimates of ground level pollutant concentrations (based on the Single Source CRSTER model discussed in Section 6.3.1) were used to generate these plots.

Sulfur Dioxide

The annual SO_2 contribution from the proposed plant is very slight, less than 3.9 $\mu g/m^3$. Figure 6.4.1-1 shows the areal extent of the 5 percent (20 $\mu g/m^3$) significant deterioration isopleth depicted on an approximately 900-square-mile area.

Selected increments of significant deterioration areas for 24-hour SO_2 concentrations are depicted in Figures 6.4.1-2 and 6.4.1-3. Isopleths are shown for 10, 25, 50, and 75 percentile values of 91 $\mu g/m^3$. As can be seen, the total allowable increase for a new source will not be exceeded by the plant. The highest deterioration amounts occur at scattered points between 1.5 and 5.0 kilometers from the site, where values range between 64 and 79 percent of the allowable deterioration increment of 91 $\mu g/m^3$ The 50 percentile values extend to an average distance of about 9.0 kilometers to the south. The 10 percent isopleth blankets virtually the entire 45-kilometer radius, which includes part of Louisville and extends as far south as Bullitt and Spencer Counties in Kentucky.

Figure 6.4.1-4 shows the maximum anticipated extent of the plant's influence on the 3-hour increment of 512 $\mu g/m^3$ of SO_2.

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Total Suspended Particulates

Figure 6.4.1-5 depicts the significant deterioration contribution from total suspended particulates for the proposed Trimble County Generating Plant. As this indicates, the maximum 24-hour concentrations account for only approximately 13 percent of the allowable significant deterioration limits of 37 μg/m^3 for a Class II region. Annual averages have not been plotted because the plant contribution is so small as to be insignificant.

Summary

Overall, the Trimble County plant influence is such that construction of a new major source of air pollution within at least 5 to 15 kilometers of the site will be precluded because the allowable increment of significant deterioration of air quality is essentially used. The zone(s) of influence of other new source(s) must be compatible with that of the Trimble County plant before approval for construction can be granted, however. Thus, the effects are far-reaching in terms of the industrial growth that can be permitted along the Ohio River between Cincinnati and Louisville. Those industries or utilities that consider future growth in this area may, of necessity, choose either to locate elsewhere or to use expensive pollution control equipment.

6.4.2 Land

Terrestrial Flora

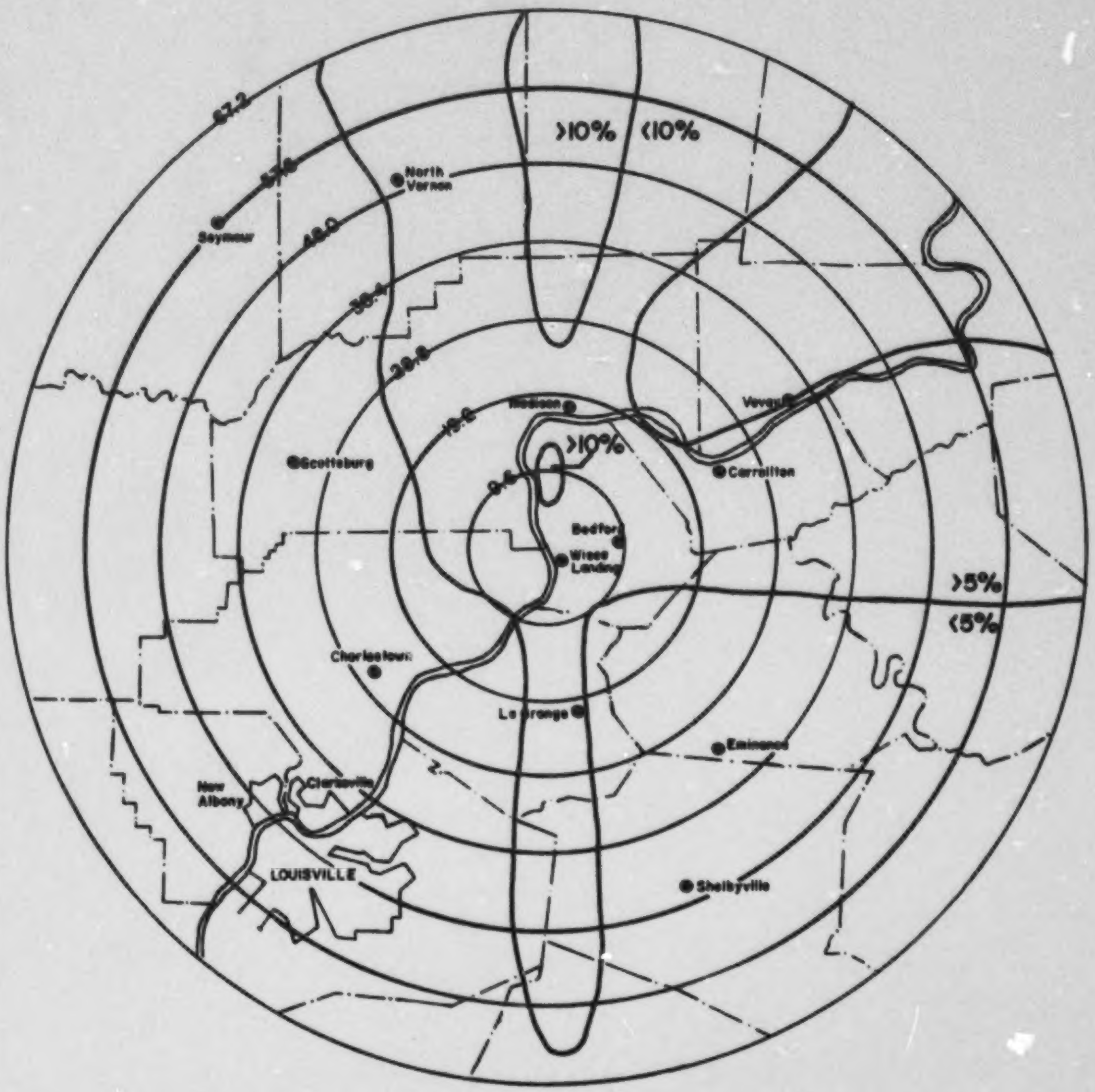
The impact on soils resulting from acid rain and dry sulfate deposition (see Section 6.3.1) is expected to be minor owing to the emission design controls which will be incorporated. Acid rains can have serious effects on crop yields and on forests because of the contribution of acids to the soils. Such effects usually occur over regions where the acid precursor effluents are emitted in much greater quantity than are expected in this case.

Terrestrial Fauna

Migrating birds may under certain atmospheric conditions be attracted to the plant site; if the migrating flock is large, the birds may collide with tall structures such as the cooling towers and the plant stacks. Death or injury to some of the birds would result from such a collision.

6.4.3 Water

If the additional barge traffic associated with the proposed Trimble County Generating Plant increases the turbidity/sediment of the Ohio River over the long term, increasing the solids levels, then water treatment facilities located downstream of the plant possibly could be faced with higher treatment costs. However, because background turbidity is often high, particularly as the result of dredging, additional barge-related turbidity is not expected to be significant.

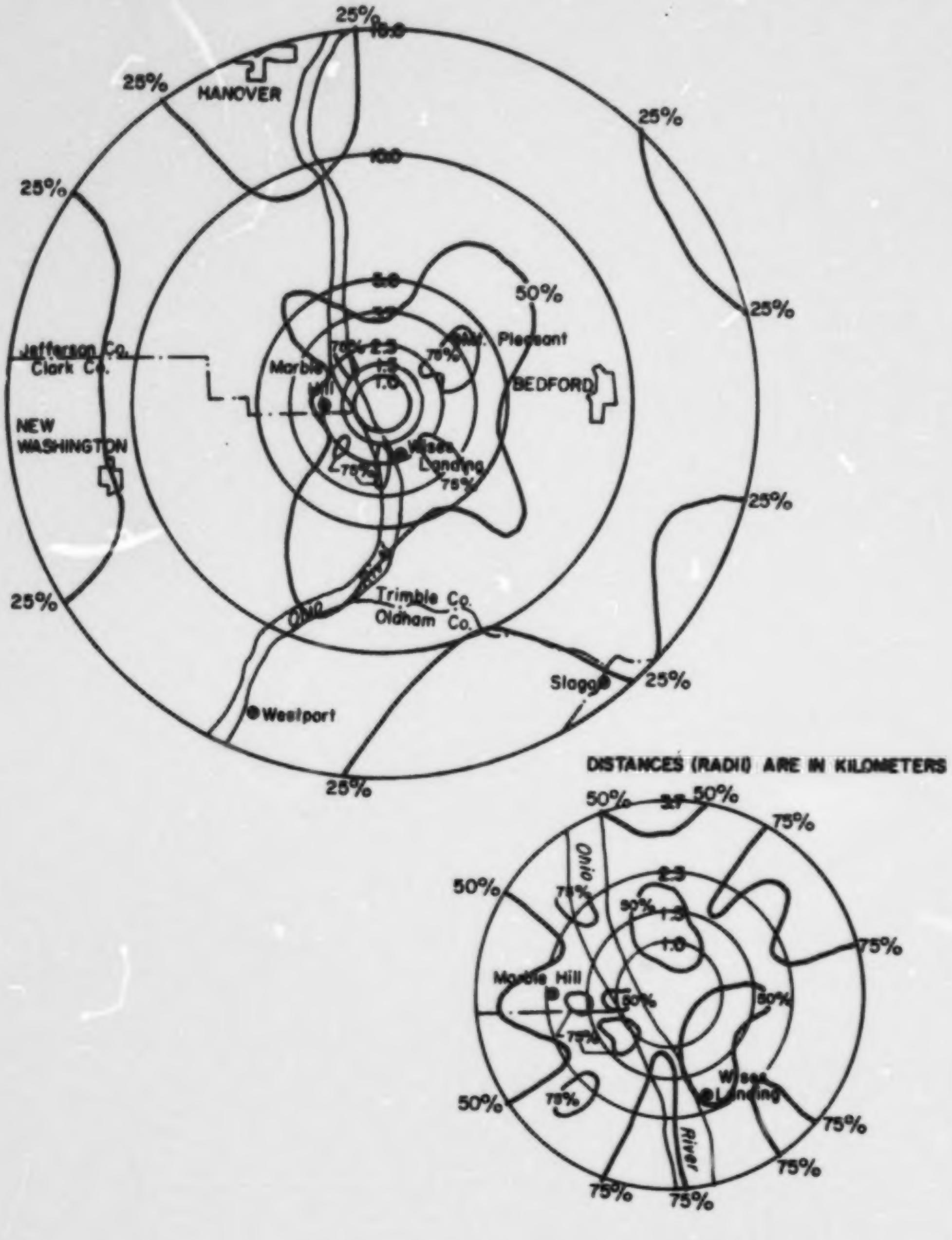

67.2
57.6
48.0
38.4
28.8
19.2
9.6
>10%
<10%
>10%
>5%
<5%
North Vernon
Seymour
Scottsburg
Madison
Vevay
Carrollton
Bedford
Wises Landing
Charlestown
La Grange
Eminence
New Albany
Clarksville
LOUISVILLE
Shelbyville

DISTANCES (RADII) ARE IN KILOMETERS

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

PROPORTION OF ANNUAL AVERAGE SIGNIFICANT DETERIORATION INCREMENT (20 $\mu g/m^3$) FOR SO_2 USED BY THE TRIMBLE COUNTY PLANT 5%, 10% ISOPLETHS

FIGURE 6.4.1-1



25%
16.0
25%
HANOVER
25%
10.0
25%
25%
5.0
50%
3.0
25%
Jefferson Co.
Clark Co.
75%
2.5
1.5
1.0
Marble Hill
Mt. Pleasant
75%
BEDFORD
NEW WASHINGTON
75%
Wises Landing
75%
25%
25%
Ohio
Trimble Co.
Oldham Co.
Slagg
25%
Westport
25%
DISTANCES (RADII) ARE IN KILOMETERS
50%
3.7
50%
75%
Ohio
2.5
50%
75%
50%
1.5
1.0
75%
Marble Hill
50%
50%
75%
50%
75%
Wises Landing
River
75%
75%
75%
75%

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

PROPORTION OF 24-HOUR AVERAGE SIGNIFICANT DETERIORATION INCREMENT (91 $\mu g/m^3$) FOR SO_2 USED BY THE TRIMBLE COUNTY PLANT 25%, 50%, 75% ISOPLETHS

FIGURE 6.4.1-2

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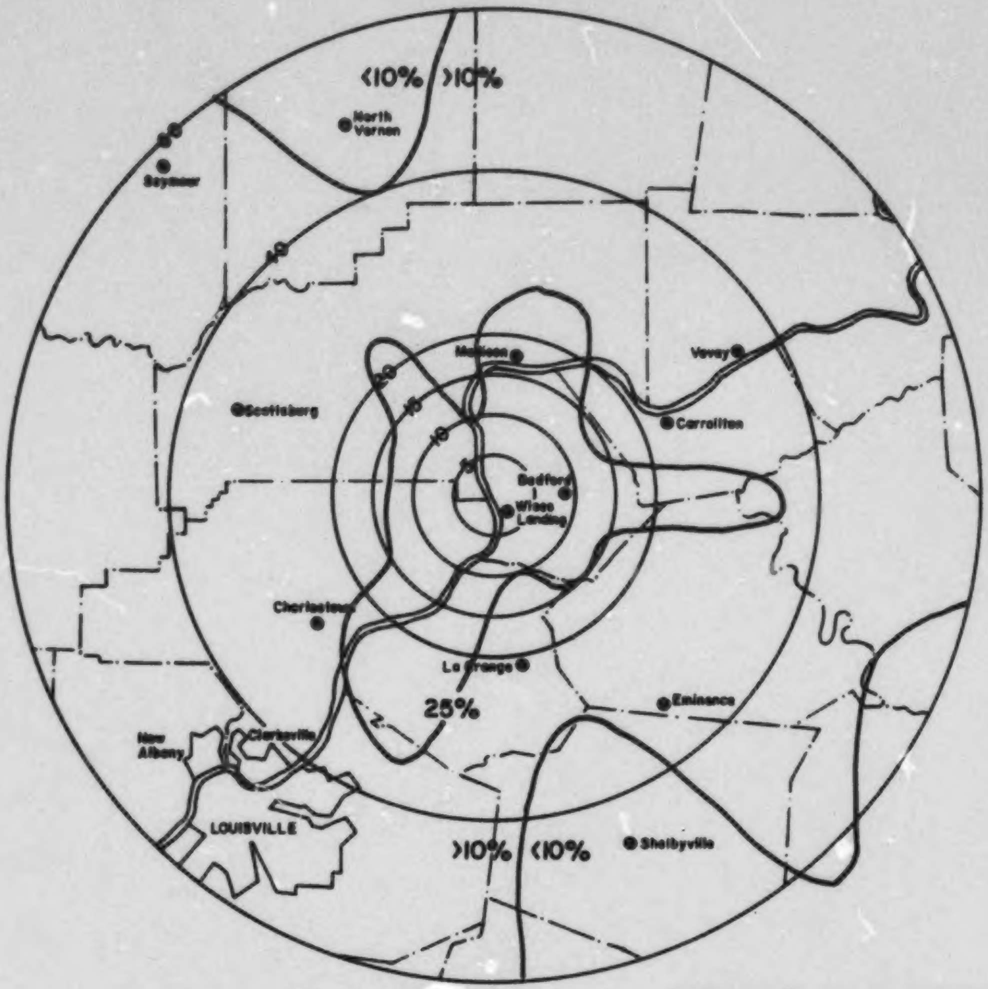
<10%
>10%
North Vernon
Seymour
50
40
20
15
10
5
Madison
Vevay
Scottsburg
Carrollton
Bedford
Wises Landing
Charlestown
La Grange
Eminence
25%
2
New Albany
Clarksville
LOUISVILLE
>10%
<10%
Shelbyville

DISTANCES (RADII) ARE IN KILOMETERS

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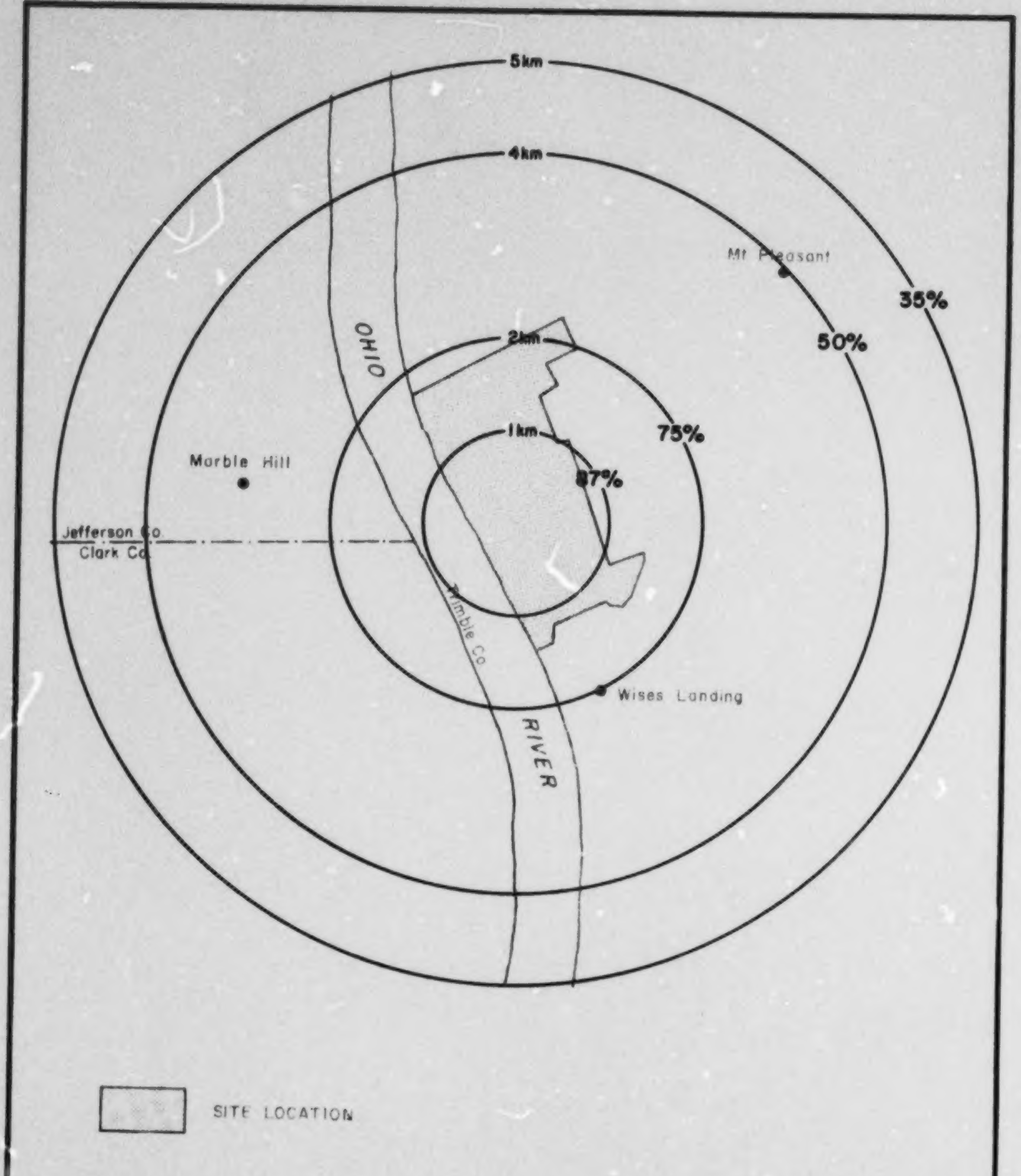
LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

PROPORTION OF 24-HOUR AVERAGE SIGNIFICANT DETERIORATION INCREMENT (91 $\mu g/m^3$) FOR SO_2 USED BY THE TRIMBLE COUNTY PLANT 10%, 25% ISOPLETHS

FIGURE 6.4.1-3


5km
4km
2km
1km
Mt Pleasant
35%
50%
75%
87%
OHIO
RIVER
Marble Hill
Jefferson Co
Clark Co
Trimble Co
Wises Landing
SITE LOCATION

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

PROPORTION OF 3-HOUR AVERAGE SIGNIFICANT DETERIORATION INCREMENT (512 $\mu g/m^3$) FOR SO_2 USED BY THE TRIMBLE COUNTY PLANT 35%, 50%, 75%, 87% ISOPLETHS

FIGURE 6.4.1-4

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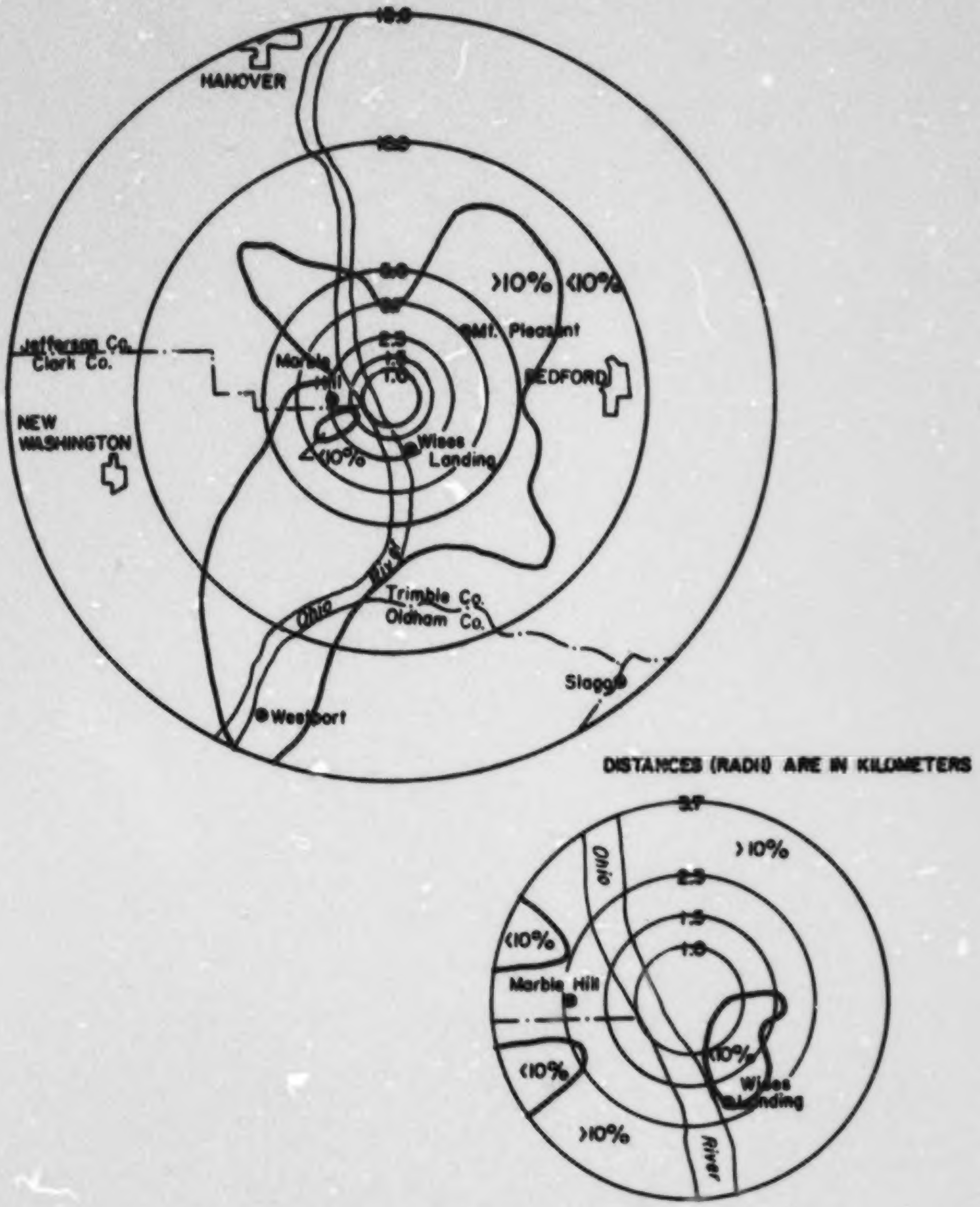
16.0
10.0
5.0
3.7
2.5
1.5
1.0
HANOVER
>10%
<10%
Mt. Pleasant
Jefferson Co.
Clark Co.
Marble Hill
BEDFORD
NEW WASHINGTON
<10%
Wises Landing
Ohio River
Trimble Co.
Oldham Co.
Sligo
Westport
DISTANCES (RADII) ARE IN KILOMETERS
3.7
2.5
1.5
1.0
Ohio
>10%
<10%
Marble Hill
<10%
<10%
Wises Landing
>10%
River

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

PROPORTION OF 24-HOUR AVERAGE SIGNIFICANT DETERIORATION INCREMENT (37 $\mu g/m^3$) FOR TOTAL SUSPENDED PARTICULATES USED BY THE TRIMBLE COUNTY PLANT
10% ISOPLETH

FIGURE 6.4.1-5

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Impingement and entrainment of commercial fish species (and their food organisms) by the Trimble County Generating Plant intake structure may reduce the general productivity of the river, and the commercial fishing industry, downstream of the plant. At present, this secondary impact does not seem very likely, as the present productivity of the river is low, and commercial fishing nonexistent. However, with the improved water quality expected to result from the enforcement of Public Law 92-500, this impact could occur later in the life of the facility.

The potential effects of acid precipitation (see Section 6.3.1) over lakes, streams, and ponds can also be serious and can adversely affect the aquatic life that inhabits these waters. Published reports indicate that literally hundreds and perhaps thousands of lakes and streams in northern Europe have become so acid that salmonoid fishes can no longer survive and that in some areas where unusually large quantities of sulfur-related pollutants are emitted, some species of fishes have become extinct.

The instances cited above are for the most part results of widespread and uncontrolled contamination from industrial and/or domestic sources that emit an abundance of acid precursors into the atmosphere. The proposed Trimble County Generating Plant will incorporate the necessary emission control equipment to greatly reduce the quantities of effluents released. In addition, the plant will employ a stack of sufficient height to disperse the remaining emissions to a degree that the impact of the plant on aquatic life in the neighboring ponds and streams will be negligible.

However, rainwater is used as a supplementary water supply at some locations in this area. The Trimble County Generating Plan could cause a slight increase in acidity in this water.

6.4.4 People

Secondary impacts resulting from commercial operation of the proposed Trimble County Generating Plant will be experienced most strongly at the local, county level. Some effects will also be experienced at the five-county intermediate level and the regional level. At the local level, the expenditure of some wages, increased tax revenues derived from plant operations, and the long-term commitment of land use resources will be the most significant effects of plant operation. At the intermediate level, induced service employment, the expansion of disposable income, and the expenditure of wages will be the most significant effect. At the regional (i.e., state of Kentucky) level, the collection of additional tax revenues will be the most significant effect.

Induced Employment

The employment of 350 plant personnel by 1989 will have the effect of stimulating a demand for goods and services in the areas where the employees spend their salaries. The increase in area income will lead to an increased demand for goods and services, which will in turn create a need for additional labor to meet the increased demands. In Trimble

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County, there is not a broadly based service sector, and many of the goods and services required by local residents are obtained from outside the county. Although this sector should undergo expansion during the plant construction phase, it is unlikely that it will develop fast enough for the majority of plant wages to be expended in the county by 1983. Furthermore (as previously indicated), in a primarily rural setting like Trimble County, there is generally excess capacity in the service sector. Thus, increased demand does not necessarily require that additional personnel be hired to meet the new demands. Plant operations will not therefore result in a major relocation of service personnel to the county, although some economic benefits will accrue to the local area.

It is likely that the majority of goods and services required by the plant's operating personnel will be obtained in Metropolitan Louisville, Carrollton, and, to a somewhat lesser extent, Madison, Indiana. Therefore it is in these locations that the service sector will expand in response to the expenditure of plant wages and salaries. If it is assumed that there is an average of approximately 1.3 service personnel for every individual employed in the basic sector in the five-county intermediate area, then during peak plant employment, an additional 455 jobs in the five-county area could be induced.

Induced Expansion of Disposable Income

The expenditure of wages earned by plant operating personnel will not only result in induced employment, but also in the expansion of disposable income. If it is assumed (see Section 6.2.4) that: (1) 50 percent of the disposable income of the operating work force is spent in the local and intermediate impact areas and (2) that an income multiplier of 2 is operating in this area, then the $487 million of disposable income of the operating work force could induce an additional $487 million in the five-county intermediate impact area. A significantly greater proportion of this additional income would be spent in the Metropolitan Louisville area than the local Trimble County area.

Tax Revenues Derived from Wages and Spending

The operating personnel and the service jobs induced by the plant payroll will constitute a new source of tax revenues for Trimble County and the state. State income tax revenues generated by the operating personnel will amount to nearly $18 million over the life of the plant, whereas the induced service employees will generate an additional $9 million. It is estimated that $13.5 million in sales tax revenues will be generated by the operating personnel and $12 million by the induced service personnel. These tax revenues will result in a major benefit to the state.

Assuming that a maximum of 190 personnel ultimately relocate to Trimble County, $9.8 million in property tax revenues could ultimately accrue to the county. This would constitute a major economic benefit and could offset many of the expenditures that will be required to upgrade the school system, roads, and other public facilities. A more detailed discussion of induced wages and taxes is presented in Section 6.8.1.

Effect of Plant Operation on Land Use

Land use patterns within the eastern area of Trimble County will be affected by the proposed generating plant. The plant will use a large percent of the allowable 24-hour significant deterioration increment for sulfur dioxide (see Section 6.4.1). Within roughly 5 kilometers (3.1 miles) of the proposed plant site, over 50 percent of the allowable significant deterioration increment will be used by the plant. In two locations, one near Mt. Pleasant and the other just east of Wises Landing, approximately 75 percent of the allowable significant deterioration increment will be used by the plant.

As a result of the projected levels of pollutants in the proposed Trimble County Generating Plant emissions and their geographical distribution, it is doubtful that any new industries with SO_2 in their stack emissions could locate within southwestern Trimble County or eastern Clark County, Indiana. Under present land use trends within the area (see Sections 2.6 and 5.6), this would deter other utilities that might want to locate along the Ohio River in this area. (Manufacturers would be hard pressed to locate in the area, regardless of the presence of the proposed generating plant, because access, labor, and markets are not readily available.)

Potential for Improved Services in Trimble County

Some of the services that are expected to be generated as a result of plant construction activities will continue to operate to serve operation personnel. Services for high-cost and specialized goods such as new refrigerators, cars, etc. will probably not be provided in Bedford. However, lower order functions, such as hairstyling, bakeries, variety stores, etc., could appear in the community as a result of new income generated by the operating personnel. Also, services already existing in Bedford will probably be improved and expanded to accommodate a wider range of demand than presently exists in the area.

Public services, and particularly the school system, may undergo a long-term improvement due to the new revenues that will be made available to the county by plant operation.

The proposed plant itself probably will not attract any secondary industries into the area as a result of the availability of additional electricity.

Most new service activities will be located in Bedford, and this could create moderate growth in the economy of the community. Carrollton and Madison may experience some expansion in their economies as a result of plant personnel spending. However, the spending will be moderate and focused on medium-order goods and services such as theaters, small department stores, and so forth. Most large items will be purchased in Louisville. Because the service sector in Louisville is already large, the total impact of plant personnel spending will be difficult to detect.

Effect of Plant Operation on Social Structure

The basic small-town atmosphere of Bedford will not be significantly altered as an indirect result of plant operations. Induced (service) employment will be provided, in part, by people already living in the area. Most services can be provided through already established stores by expanding the range of services. Thus, secondary impacts will not cause the business community to be drastically altered, nor will there be a tremendous influx of new people into the area to work at new service jobs. Median age and education levels will not be significantly modified.

Effect of Plant Operation on Cultural Aspects and Recreation

Plant-induced (service) personnel will not create any demand for unique or different cultural activities within Trimble County. Existing recreational facilities within Trimble County and neighboring counties will probably satisfy the demand of secondary plant-related personnel.

6.5 LONG-TERM VERSUS SHORT-TERM IMPACTS

Short-term impacts are herein considered to be those that will cease with either the construction or operation of the proposed generating plant. Long-term impacts are considered to be those that continue to be felt after the plant has been decommissioned.

Both the beneficial and adverse (primary and secondary) effects of plant construction and operation have been discussed in Sections 6.1 through 6.4. (Measures to mitigate unavoidable impacts are discussed in Section 7.0.) All of the impacts discussed in these sections will cease with the decommissioning of the plant, with the following exceptions:

1. Ravines RA and RB will be forever removed from their original land use; they could, however, be reclaimed for structural or recreational uses

2. The present channel of Corn Creek will be permanently altered

3. The new service industry induced by the plant could attract other industries to the area. The economic and social effects of these other industries would constitute an indirect impact of the proposed plant that would remain after the plant ceased to operate. Furthermore, some of the economic and social changes caused by the proposed plant would continue beyond the life of the plant--for example, population added to the area would remain or only slowly disperse.

   The tax revenues, income, and induced (service) jobs provided to the state, county, and local communities and persons will be withdrawn, which could result in the withdrawal of some of the benefits they provided. This could be offset if additional industry has moved into the area. In any case, the local area will not be returned to a condition worse than its present condition

4. The use by the proposed plant of substantial portions of the allowable increment of significant deterioration for SO_2 (Sections 6.4.1 and 6.4.4) could affect regional industrial growth patterns beyond the decommissioning of the plant, in that patterns established during operation of the plant would be slow to reverse themselves

5. The destruction of the agricultural fields surrounding the oxbow areas will result in the reduction or complete loss of a well-established stopover point for migrating waterfowl, as well as an important habitat for other wildlife

If the plant site is not eventually restored, as much as possible, to its original condition (with the exceptions noted above), the proposed project would foreclose future options on the land, thus significantly interfering with any other long-term uses of the environment.

6.6 COMMITMENTS OF RESOURCES

Three kinds of resources will be committed to the project: natural, man-made, and human. Natural resources that will be committed are air, land (including natural vegetation and wildlife habitat), water (including aquatic habitat), and the coal and other raw materials used to operate and maintain the facility. Man-made resources consist of the tools, equipment, and other items used to construct, operate, and maintain the facility. Human resources are the man-hours committed to the construction and operation of the plant, and the capital committed to the project.

The various resources that will be committed to the proposed project are committed either temporarily (for the life of the plant) or permanently (irreversible and irretrievable commitments of resources).

Table 6.6-1 lists the various resources that will be committed to the proposed project and identifies the nature of the commitment.

6.7 UNAVOIDABLE ADVERSE IMPACTS

Sections 6.1 through 6.5 discuss in detail the impacts of the proposed project. Those adverse impacts that cannot be avoided and cannot be mitigated are the release of pollutants to the air (Sections 6.1.1, 6.2.1, 6.3.1, and 6.4.1); the effects of additional barge traffic on the aquatic and human environment (Sections 6.1.3, 6.1.4, 6.2.3, 6.3.3, and 6.3.4); economic, social, and visual stresses on local communities, particularly Bedford and Wises Landing (Sections 6.1.4, 6.2.4, 6.3.4, and 6.4.4); loss of agricultural land (Section 6.1.2); and secondary impacts on regional land use (Sections 6.4.1 and 6.4.4). Adverse impacts that can be mitigated to some degree are increased noise levels (Sections 6.1.4, 6.3.4, and 7.1); dust (Sections 6.1.1, 6.3.1, and 7.2); water pollution (Sections 6.1.3, 6.2.3, 6.3.3, 6.4.3, and 7.3); and loss of natural terrestrial and aquatic habitats (Sections 6.1.2, 6.1.3, 6.2.2, 6.2.3, 6.3.2, 6.3.3, 6.4.2, 6.4.3, and 7.3.1).

TABLE 6.6-1

RESOURCES THAT WOULD BE COMMITTED TO THE PROPOSED TRIMBLE COUNTY GENERATING PLANT

Resource	Development Phase	Nature of Commitment
NATURAL RESOURCES		
Air	Operation	Commitment of up to 20% of the allowable annual-average increment of significant deterioration for SO_2; up to 88% of the 24-hour-average increment of significant deterioration for SO_2; up to 92% of the 3-hour-average increment of significant deterioration for SO_2; 13% of the 24-hour-average increment of significant deterioration for particulates. This commitment will end when the plant ceases to operate
Land	Construction through operation	Removal of approximately 2,300 acres of land from present uses; this land will be committed to the proposed industrial use for the life of the project.
Surficial soils	Construction	Removal of 421 acres of topsoil; this commitment is irretrievable.
	Operation	Irretrievable loss of 1,440 acres of low-productivity topsoil in Ravines RA and RB.
Vegetation	Construction through operation	Loss of 1,844 acres of vegetation, including about 400 acres of cropland.
Terrestrial wildlife	Construction through operation	Reduction of area wildlife populations. Reductions or loss of well-established stopover point for migrating waterfowl

TABLE 6.6-1 (Continued)

Resource	Development Phase	Nature of Commitment
Terrestrial wildlife habitat	Construction through operation	Loss of 1,844 acres of potential wildlife habitat.
Aquatic biota	Construction	Loss of aquatic biota from construction areas in river and Corn Creek. The species lost will be replaced by other, probably similar, species after construction ceases, although the replacement populations may not be as dense as the present ones.
Aquatic habitat	Construction through operation	Loss of aquatic habitat along the river front. This loss of Ohio River habitat will be somewhat mitigated by the new substrates that will be provided by the docking and unloading facilities. However, turbidity or accidental spills may inhibit the productivity of the habitat in the Ohio River.
	Construction	Loss of aquatic habitat in the relocated portion of Corn Creek. This loss will be long-term but a comparable habitat will gradually be reestablished.
Runoff	Construction	Loss through evaporation of some of the water impounded during construction; this loss would eventually be retrieved as the water returned to the basin through the hydrologic cycle
	Operation	Removal of water impounded in the onsite disposal pond. This water will be used as plant process water for life of facility. Some water in retention basin will be lost to evaporation but will return through hydrologic cycle.

TABLE 6.6-1 (Continued)

Resource	Development Phase	Nature of Commitment
Ohio River water	Operation	Loss of a maximum of 27,600 gpm to consumptive water uses (this is less than .01 percent of anticipated low flow in the river at the site). Most of this loss will be to evaporation and drift; the water will therefore return to the basin through the hydrologic cycle.
Ground water	Construction	Irretrievable loss of approximately 100,000 gallons per day (maximum; 44,000 gpd average) for the concrete batching plant, drinking water, sanitary facility, equipment washing, and dust control uses.
	Operation	Irretrievable loss of approximately 11,000 gallons per day to the plant for potable water and sanitary facility uses.
Aggregate	Construction	Irretrievable commitment of 228,528 tons of aggregate, a finite resource, to the project.
Sand	Construction	Irretrievable commitment of 150,568 tons of sand, a finite resource, to the project.
Limestone	Operation	Irretrievable commitment of approximately 27,000,000 tons of limestone, a finite resource, to the project.
Coal	Operation	Irretrievable commitment of approximately 139,000,000 tons of coal over the 30-year life of the facility. This represents a large commitment of a valuable, limited natural resource.
Fuel oil	Operation	Irretrievable commitment of 1,830,000 barrels of fuel oil, a limited resource, for start-up and flame stabilization.

TABLE 6.6-1 (Continued)

Resource	Development Phase	Nature of Commitment
MAN-MADE RESOURCES	Construction through operation	Irretrievable removal from any other use of the tools, equipment, and other items used to construct, operate, and maintain the plant.
HUMAN RESOURCES	Construction	Irretrievable commitment of the man-hours required to construct the facility (74,280 man-months, based on the estimated average number of workers per year, 1978-1991).
	Construction through operation	Loss of the present rural character and aesthetic characteristics of the plant site.
		Irretrievable commitment of approximately $1,123.7 million (capital investments) and $394.2 million per year (operating costs) to the project. This money would not be available for any other use.
	Operation	Irretrievable commitment of man-months required to operate the facility (143,208, based on estimated peak requirement of 350 personnel over a 30-year plant life).
		Removal of certain portions of the plant site region from use by industries with high SO_2 emissions; this commitment would end when plant operation ceases, although the patterns that could have occurred in the meantime may in effect cause the removal to be irretrievable.

6.8 BENEFIT/COST ANALYSIS

6.8.1 Benefit/Cost Methodology

Direct benefits of the proposed Trimble County Generating Plant were computed from the electrical output of the four units at the proposed plant, multiplied by an escalated rate per kilowatt hour (KWH). Energy output was taken from data provided by the Applicant. Rates were taken from the Applicant's Financial and Operating Statistics (1976) and escalated on the basis of their published rates over the period 1965 to 1975. Final computation of the value of energy was based on a 30-year period of operation for each unit (operating at a capacity of 60 percent, with losses of 7 percent due to energy absorbed by distribution or other non-revenue uses).

Indirect benefits of the proposed plant were defined as taxes that would result from the construction and operation of the proposed facility, increased income during both the construction and operation phases, and the potential for improved community public services.

Taxes included in the analysis were those itemized by the Kentucky Department of Commerce and the Department of Revenue. Actual rates are those published by the Department of Revenue.

Property taxes for the proposed plant were based on estimates of real estate, manufacturing machinery, and other tangible property provided by the Applicant.

Personal income taxes were calculated by means of estimates for a typical four-member family as provided by the U.S. Internal Revenue Service in Cincinnati (Federal Income Tax) and published data from the Kentucky Department of Commerce (State Income Tax). Personal income taxes were computed for personnel working directly on the construction and operation of the plant and for any personnel that would be induced by the spending of these first two groups of people.

Net state corporate income tax in Kentucky was also taken from published state data. Federal corporate income tax was based on a statutory Federal income tax rate of 48 percent. (Net income was projected to increase at an annual rate of 4 percent from the level achieved in 1975.)

Computation of state sales taxes assumed that 50 percent of a person's disposable income would be expended on retail sales. Sales taxes were calculated for construction, operation, and induced personnel.

Construction income was assumed at $16,000 per employee in 1976, escalated at 5.5 percent per year over the construction phase of the project. Operating wages were figured at $14,000 per year in 1977, escalated at 5.5 percent per year over the operating life of the project. The average income of service workers in Trimble County was assumed as $10,000 in 1977, and was escalated at 5.5 percent per year over the construction and operation phases of the project. Service employees in Metropolitan Louisville and Trimble

County were assumed to have an annual income of $10,000 per year, which was escalated at 5.5 percent for the construction and operation phases of the project.

Direct costs of the proposed plant, including construction and other development costs, were provided by the Applicant. Operating costs were calculated from total operating expense data taken from the Applicant's Financial and Operating Statistics (1976). These total operating expenses were divided by total kilowatt hours to yield a per-KWH operating expense, which came to 1.704¢ per KWH in 1975. This figure was then escalated at 3 percent per year over the operating life of the project. This per-KWH figure was multiplied by the total energy output over the life of the project to get the total operating expenses for the proposed plant.

The indirect costs of the proposed project were determined to be the costs to the community (Trimble County and Bedford) of providing additional services required as a result of the construction and operation of the proposed plant.

It must be emphasized that many of the dollar costs and benefits described in this section are approximations that are subject to change. This is particularly true for the tax assessments. These are extremely difficult to calculate because of complexities in state and local laws. At such time when plant valuations can be more accurately estimated, more accurate costs and benefits can be calculated.

6.8.2 Benefits

Direct Benefits - Value of Delivered Energy

The direct benefit of the construction of the proposed Trimble County Generating Plant will be the energy that it will contribute to the Applicant's system. At full operation, the proposed plant will contribute an estimated 12,299 million kilowatt hours (KWH) annually to the Applicant's system.

The most useful measure of the direct benefit of the proposed Trimble County Generating Plant is the value of the energy delivered to the customers of the Applicant's system. It is, of course, not possible to distinguish the power produced by the proposed plant from that of any other source, once that power has entered the Applicant's transmission and distribution system. Therefore, the value of the power produced by the proposed plant and delivered to the system must be calculated from rates that all the Applicant's customers pay for their electric power.

Before determining the expected monetary value of the power produced by the proposed plant, however, it is important to consider the relationship of the Trimble County Generating Plant to the Applicant's total system. In 1975, there were 7,024 million KWH of generating capacity in the total system (Louisville Gas and Electric Company, 1976). Of this total, 6,670 million KWH were provided by steam, 350 million through hydro, and 4 million via combustion and turbine generators. An additional 414 million KWH were purchased from OVTC (a subsidiary), and 118 million were purchased or interchanged with other systems. In 1975, the Applicant sold 7,320 million KWH. The projected annual net energy required from 1976 to 1984 is as follows (Louisville Gas and Electric Company, 1975):

Year	Million KWH
1976	7,485
1977	8,042
1978	8,697
1979	9,455
1980	10,160
1981	11,527
1983	12,231
1984	12,966

Thus, the Trimble County Generating Plant will provide a direct benefit to the Applicant's system by providing additional energy to help meet the increases in energy consumption projected to occur within the system (see Section 1.0 for a complete description of the Applicant's projections of energy demands).

The total energy production of the proposed plant, together with the equivalent sales revenue value of that power for 1983 to 2019, is given in Table 6.8.1-1. The data in the table are based on an assumed economic life of 30 years for each unit of the proposed plant, with each unit operating at an average capacity of 60 percent and with sales revenues reflecting 6.0 percent of production being absorbed by distribution losses and other nonrevenue uses. On the basis of these factors, total revenues attributable to the proposed plant over its operating life are estimated at $16.85 billion, assuming an initial average price in 1983 of 2.925¢ per KWH, escalated from 1975 rates at a nominal rate of 2.5 percent each year.

Indirect Benefits

The indirect benefits of construction and operation of the proposed Trimble County Generating Plant will accrue primarily to the project workers (both construction and operation). Indirect benefits, both monetary and non-monetary, will tend to be fairly broadly distributed. They will take the form of (1) increased local employment and income (for both project and non-project personnel); (2) increased business for suppliers of retail goods and services to project personnel, as well as for suppliers of materials and services for the project itself; (3) increased local, state and federal taxes; and (4) improved local amenities and assets (roads, community services, and educational facilities).

The location of the proposed plant and the size of the undertaking (in terms of the construction and operation work force and payrolls, requirements for goods and services, and duration of construction and operation phases), relative to the location and density of the population of the surrounding county, determine the extent and distribution of the indirect economic and social effects likely to result from the project. Bedford will provide some of the services required by the project, including housing for personnel relocating from distant locations. In the rural areas surrounding the proposed site, however, population is sparse.

TABLE 6.8.1-1

PROJECTED ENERGY PRODUCTION AND SALES REVENUE TRIMBLE COUNTY GENERATING PLANT[a]

Year	Million KWH	Sales Revenue[c] ($000's)
1983	2,601.7	71,534
1984	2,601.7	73,319
1985	5,203.4	150,257
1986	5,203.4	153,974
1987	8,751.2	265,374
1988	8,751.2	271,955
1989-2013	12,299.0[b]	13,356,074
2014	9,697.3	570,904
2015	9,697.3	585,124
2016	7,095.6	438,813
2017	7,095.6	449,751
2018	3,547.8	230,508
2019	3,547.8	236,278
	TOTAL	$16,853,865

---

[a] At 2.785¢ per KWH in 1981, escalated at 2.5 percent each year.

[b] Per year. These are years when all four units will be in operation.

[c] 6 percent of production absorbed by distribution losses and other non-revenue uses.

In view of the fact that most procurements for construction of the proposed plant will be made outside of Trimble County, and some outside of Louisville, it is expected that the construction payroll will be a primary source of benefits during construction. During operation of the proposed plant, payroll will also be a primary source of benefits. Over the life of the construction and operation phases of the proposed project, it is estimated that about $848.2 million will be paid to construction and operation personnel. An additional $848.2 million will be induced by these personnel spending their wages.

Increased Tax Revenues

Construction and operation of the proposed power plant will contribute significantly to local, state and federal tax revenues.

Property taxes. Property taxes paid by the Applicant (both state and local) during the construction phase will total almost $2 million. Total real estate taxes on all four proposed generating units during construction are projected at approximately $875,000. Taxes on manufacturing machinery are projected at approximately $1,038,000 during the construction phase. Slightly more than $27,000 in taxes are projected for other tangible property during the construction phase. The local taxes accrued as a result of constructing the proposed plant will total approximately $557,600. State property taxes will total approximately $1,382,000[a].

Yearly taxes during operation of the proposed plant will be approximately $500,000 accrued to the local tax base and $1,300,000 accrued to the state tax base. Total local property taxes to be paid during operation of the proposed plant are $15.5 million. State property taxes will total approximately $40.3 million.

In addition to property taxes paid by the Applicant, personnel who work at the plant will also pay a property tax. Because wages used to pay these taxes are derived either directly or indirectly from construction and operation of the proposed plant, the taxes are also a benefit derived from the proposed plant. Application of the existing property tax rates for Trimble County, based on the assumption that approximately 5 percent of the peak construction work force will relocate to Trimble County, produces an estimated total of $211,500 in property taxes to be paid by the construction labor force. Property taxes assessed on operating personnel who will have relocated to the county could amount to $9.8 million over the life of the project.

Income Taxes. Kentucky, along with most states, levies a tax on net corporate income. For taxable years beginning January 1, 1972, corporations with business income in Kentucky paid a tax of 4 percent on the first $25,000 of taxable net income and 5.8 percent on taxable net income in excess of $25,000. On the basis of the trend established by the Applicant over the period 1965-1975, an annual growth of 4 percent in net income was projected over the operating life of the project. Although income could increase substantially once the proposed Trimble County Generating Plant is in operation, the deactivation of other plants ready for retirement will probably reduce total net income. In addition, maintenance costs on older equipment prior to its being decommissioned will erode net income.

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[a] The following are the bases for the above figures: (1) Local tax: 51.6¢ per $100 assessed value on real estate and other tangible property; (2) State tax: 31.5¢ per $100 assessed value on real estate; 15¢ per $100 assessed value on manufacturing machinery; and 45¢ per $100 assessed value on other tangible property.

The total state corporate net income tax to be paid by the Applicant is expected to be approximately $138.6 million over the active life of the project. Federal income taxes are expected to be approximately $1,209.4 million over the operational life of the project. (This figure was based on the same projected net income used to compute the state income taxes. The federal income tax was assumed as 48 percent of net income, the statutory federal income tax rate. The Louisville Gas and Electric federal income tax rate was actually 45.4 percent in 1975 and 46.3 percent in 1974).

Kentucky places a tax on personal income earned within the state. A married person with two children using the standard deduction would have approximately $190 withheld for state taxes from an income of $9,000. An income of $12,000 has a tax level of about $275. At $16,000, the state income tax reaches $450, given the previous assumptions.

State income taxes generated by the construction personnel are projected at $4.5 million. Operating personnel are expected to generate $17.8 million in state income taxes over the commercial life of the proposed project. Service workers are expected to generate an additional $11.1 million in state income taxes.

Federal income taxes paid by all construction personnel are projected at $18.3 million. Operating personnel will add approximately $3.5 million federal tax dollars during commercial operation of the plant. In addition, service workers will contribute approximately $93.0 million in federal taxes during construction and operation of the proposed plant.

In sum, state and federal income taxes will total $228.2 million over the construction and operating life of the proposed Trimble County Generating Plant.

Sales Tax. A 5 percent sales tax is levied on all retail sales to consumers in Kentucky. The sales tax that will result from construction personnel spending is projected at $2.86 million. Spending by the personnel operating the proposed plant will generate an additional $13.58 million in sales taxes. Service workers will generate approximately $16.00 million in sales taxes. Total monies resulting from collection of sales taxes during the construction and operation of the proposed Trimble County Generating Plant are projected at $32.4 million.

Increased Employment and Income

Construction and operation of the proposed plant will involve the expenditure of many thousands of man-months of labor over the course of the project. During the period of maximum construction employment, an estimated 695 workers and supervisory personnel will be on the job. After completion of construction, an estimated 350 personnel will be employed to operate and maintain the plant. Together, these workers will support an expanded number of service workers, some in Trimble County but most in the Metropolitan Louisville area. Gross salaries of construction and operation personnel employed at the plant could total $850 million over the life of the project. The impact of this income will benefit Trimble County and the Metropolitan Louisville area most significantly (see Sections 6.1.4, 6.2.4, 6.3.4, and 6.4.4).

Opportunities for increased employment and expanded income should not be thought of only in terms of construction and operation employment and salaries. The employment of 695 laborers during the peak construction period could result in an additional 904 project-induced jobs by means of the well known multiplier effect. The employment of 350 full-time operating personnel could result in an additional 455 project-induced jobs. Estimated construction and operation payrolls amounting to $850 million over the life of the project could induce an additional $850 million in salaries for service workers.

Potentials for Improved Community Public Services

Communities in Trimble County may be able to upgrade the quality of their public services because of the added revenues generated by the proposed power plant. In particular, facilities such as water treatment and distribution systems, liquid and solid waste collection and disposal systems, roads, hospitals, and public safety organizations may benefit from the additional revenue.

It may be possible to upgrade Trimble County services because the county is a primary recipient of plant generated tax revenues. Such services include the sheriff and county fire departments (serving unincorporated communities and areas), the county hospital, county road maintenance, and various judicial and administrative activities (court recorder, clerk, etc.). For services supplied by incorporated communities, additional tax funding for expanded services will not come directly from the plant (since it is not being built in incorporated areas), but indirectly via the medium of services shared with the county. In such areas as water and waste treatment systems, police and fire protection, road maintenance, and public health, to name a few, joint town-county participation is possible, with the county providing capital for equipment acquisition and the communities providing manpower. The county's additional tax revenues from the plant will benefit both town and county in such arrangements.

An additional benefit to both county and incorporated area residents will be the resources available to the county for developing a planning and zoning capability. Planning is presently conducted in the context of a regional planning organization, specifically the Kentuckiana Regional Planning and Development Agency, Inc. With resources to sustain a planning agency exclusively concerned with Trimble County interests, the county should be able to improve greatly its ability to define local needs and problems and to develop solutions to them.

Summary Statement of Economic and Social Benefits

The principal direct and indirect benefits projected to accrue to the project region communities and economy from the construction and operation of the proposed Trimble County Generating Plant are summarized in Table 6.8.1-2.

6.8.3 Costs

Development of the proposed 2,340-MW Trimble County Generating Plant will involve the expenditure of approximately $1,354 million in investment costs and about $394.2 million per year thereafter in operating costs (1977 dollars). These direct or internal costs must be borne by the Applicant and its customers. In addition, the residents and communities in the region where the plant is to be located must bear certain costs (both monetary and non-monetary) that will arise from construction activities.

Direct (Internal) Project Costs

Direct costs may be divided into two major categories: capital investment costs associated with planning, design, construction, and financing of the project, and operating costs. In addition, a complete analysis requires that decommissioning costs, incurred at the end of the useful life of the facility, be considered.

Capital Investment Costs

The Trimble County Generating Plant will involve the commitment of approximately $1,354 million in construction and other development costs. These construction costs include $332 million for Unit 1, $234 million for Unit 2, $380 million for Unit 3, and $408 million for Unit 4.

Operating Costs

Total operating expenses include fuel, purchased and interchanged power, maintenance, depreciation, taxes, investment tax credit deferred, and amortization of investment tax credit. Over the period 1970-1975, the Applicant's total operating expenses per kilowatt hour (KWH) increased on an average of 7.74 percent. The operating costs for major expense groups breaks down as follows (1975 operating data):

TABLE 6.8.1-2

SUMMARY - PROJECTED ECONOMIC AND SOCIAL BENEFITS OF PROPOSED TRIMBLE COUNTY GENERATING PLANT

DIRECT BENEFITS

Expected average annual KWH's	10,249.2 million

Proportional distribution of electrical energy, 1975:

	Million KWH	Percent
Large industrial	2,473	37.0
Residential	2,031	30.4
Large commercial and small light and power	1,554	23.2
Public street and highway lighting	50	0.8
Other	577	8.6

Total projected revenues from sale of energy produced by the Trimble County Generating Plant	$16,854 million

INDIRECT BENEFITS

Employment benefits

Direct employment of construction workers (maximum work force)	695
Total man-months of construction labor, 1978-1991	74,280
Operation personnel (maximum work force)	350
Total man-months of operation labor, 1983-2019	143,208

Income benefits

Total construction payroll, 1978-1991	$152.5 million
Total operation payroll, 1983-2017	695.7 million
Contribution to disposable income in five-county intermediate impact area	
Construction labor force	106.8 million
Operation labor force	487.0 million
Induced increase in region income	848.2 million
Aggregate increase in regional disposable income, 1978-2019	1,442.0 million

TABLE 6.8.1-2 (Continued)

Tax benefits	
Property taxes from the plant	
During construction (total from 1978 through 1991)	$ 1.9 million
During commercial operation of the plant (total 1983 through 2019)	55.7 million
Property taxes from employees (total)	
Construction personnel	$211,500
Operation personnel	9.8 million
Income taxes derived from plant operations (total)	
Federal	$1,209.4 million
State	138.6 million
Income taxes from employees (total)	
Construction personnel	$ 22.8 million
Operation personnel	101.3 million
Secondary or service workers	104.1 million
Sales tax on consumable goods	32.4 million

Fuel - \$.00519/KWH
Maintenance - .00614/KWH
Depreciation - .00258/KWH
Taxes - .00381/KWH
Other - .00382/KWH

TOTAL \$.01704

Projecting this over the life of the project yields an estimated \$14,586 million for total operating costs of the proposed Trimble County Generating Plant.

Decommissioning Costs

The rationale for including decommissioning costs in the analysis of investment costs rests on the premise that the environment that was altered by the construction of the proposed power plant should be restored as nearly as possible to its original state after the plant is no longer in use. There is only limited experience to help estimate the costs of such work, which would have to include not only the dismantling of the plant, but also the restoration and sanitizing of the site. In an environmental impact statement for the Susquehanna Nuclear Plant, the AEC cited a "Type 3" decommissioning, with an estimated 1972 cost of \$50 million, to dismantle a nuclear plant of similar generating size to the proposed Trimble County Generating Plant. A recent report prepared by the Ohio Power Siting Commission on the socio-economic impacts of nuclear power plants contains an estimate of \$70 million to dismantle a nuclear power plant and fill all cavities (Traub, 1975). No such studies were found for fossil fuel plant decommissioning costs: however, they should be less, because there are no nuclear-related precautions involved. Most of the land occupied by the plant could be reclaimed; the ravines are intended to be suitable for structural or recreational use.

External (Indirect) Project Costs

The communities and residents of the project region will have to bear some of the costs arising from construction and operation of the proposed power plant. These costs are termed indirect or external because they are not borne by the direct beneficiaries of the project--the Applicant and its customers. Because the indirect costs result from the altering of social and economic relationships in the local area, the relative magnitude and duration of the costs are, to a considerable extent, a function of the size of the population and the level of development of the regional communities.

In the shorter term, i.e., during the construction phase of the project, costs generally take the form of pressures from relocated workers on local community resources such as housing, schools, and public services. Short-term costs also include the disruptions to the lives of people displaced by the project.

Costs of a longer term nature generally take the form of changed economic, aesthetic, and cultural values arising when plant development displaces or alters the quality of local areas used for agriculture, recreation, or other economic or cultural purposes. The permanent operating staff also generates long-term requirements for community services.

In the following pages such indirect costs as may be attributed to the proposed power plant are identified and evaluated. The focus of attention is on Trimble County (the local impact area). As appropriate, however, cost impacts in other areas will be assessed.

Short-Term External Costs of Plant Development

Short-term costs are associated with the construction phase of the project. During construction, many project employees will commute to the site. While some of these commuters will be residents of Trimble County and neighboring counties, most of the commuters will be from the Louisville metropolitan area. Of particular significance are the temporarily and permanently relocated workers who will need a variety of community services while residing in the local area.

By 1983, when the construction employment reaches its peak, an estimated 35 employees will have relocated temporarily or permanently to the local impact area. Most of the workers relocating to Trimble County can be expected to settle in or near Bedford, because it offers the greatest variety of urban amenities in the local area. In 1970, a survey undertaken by the Kentucky Housing Corporation (Commonwealth of Kentucky, 1974) found that approximately 527 housing units were needed in the area. This need was projected to 623 by 1975 and 779 by 1980 (assuming only a "natural" increase in the population and housing bases). Construction of the proposed Trimble County Generating Plant may compound this problem.

Given the existing housing industry in the area, there probably will be a slow response to increased demand for housing. In addition, there probably will be pressure on local landowners to permit workers to park campers and trailers on rural lots near the project site. Unless the county acquires authority to impose zoning restrictions on such unregulated forms of housing development, some haphazard and uncoordinated development of trailers and camper housing in rural parts of Trimble County is likely. Aesthetic qualities and health standards may suffer as a result.

The additional permanent and transient construction workers will require a variety of public services in communities near the site, since most of the workers will probably settle in Bedford. This city will receive the brunt of having to provide such services as water supply, sewage collection and treatment, electric power, telephone services, and fire and police protection. Water supplies at present are adequate to handle a considerable number of relocated workers. However, with any new housing or other construction, new water lines would have to be added. To the extent that some workers may opt to build houses with their own wells on country lots, they would not cause any new water line construction, nor would they place any demand on existing public water supplies.

No sewage system presently exists in or near Bedford; all structures are on septic tank systems. Any new houses constructed would have to be located on sufficiently large lots to ensure proper drainage.

Bedford presently has two pump engineers and a volunteer fire department of 35 men, sufficiently large to handle anticipated expansion. Police protection, however, may be extended.

The local community services most likely to require expansion as a result of the project are traffic control and road maintenance. The need for such expansion is seen principally near Bedford at the intersection of US 42 and SR 754. The addition of construction deliveries over SR 754, together with the traffic that can be anticipated from construction personnel commuting to and from work, will place a burden on the existing road. By 1977, 23 delivery trucks and 69 passenger vehicles are expected on SR 754 as a direct result of construction activities. At the height of construction activity in 1985 and 1987, 400 construction-related vehicles, on the average, will be using SR 754 and CR 1488 for access to the site. The timing of the majority of this traffic in the morning and evening will significantly affect the existing road.

The county will incur increased road maintenance costs because of the project construction traffic. The tax revenues to be paid on the plant's land and buildings should substantially exceed such costs, however.

The ability of local governments to deal with project-related costs and to take advantage of tax benefits generated by the plant can be enhanced greatly by adequate planning. Continuing liaison and communication between project management and local officials and planning agencies are necessary to permit community residents to be aware of project plans and for project management to be sensitive to community views and interests affected by the project. Such interaction gives local governments time to anticipate changes in area service requirements and to plan community finances accordingly.

School expansion to accommodate normal population growth in the five counties surrounding Trimble County will permit the additional project worker children to be absorbed. In the case of the Trimble County schools, the additional school tax revenues generated by the project will permit substantial improvements in public school facilities throughout the county. Thus, when the operating personnel begin relocating to the county toward the completion date of the project, the school-age children of those with families should not impose an excessive burden on the county schools.

Long-Term External Costs of Plant Development

The longer term costs imposed on local communities arise from the physical existence and operation of the power plant.

Costs associated with the physical existence of the plant are mainly opportunity costs, in that alternative (including previous) uses of the land will be foregone. The plant also alters the appearance of the area, but it is doubtful that this will translate into reduced local property values.

Costs associated with the operation of the facility arise in several areas. These costs, the result of the influx of permanent operating personnel, are principally in the area of community services; changes in area noise levels and meteorological conditions from operation of the plant are also to be expected. A more detailed analysis of these impacts is presented in the following paragraphs.

Farms formerly located within the level, terrace area of the site are estimated to have contributed approximately $34,000 to the farm income of Trimble County in 1969 (U.S. Department of Commerce, 1972). This represents less than 1 percent of the county's market value of all agricultural products in 1969. Because the power plant would consume very few local products, and because the revenues earned from sales of plant-generated electrical energy would not accrue directly to the plant or county residents, it is not proper to compare the value of the plant's production with the value of agricultural production from the same land. A more relevant comparison would be of the respective property tax values for that land in farming versus in power generation.

As farmland, the site would have an assessed value of about $0.5 million in 1977. At the existing property tax rate of $.81 per $100 assessed valuation, this would yield revenues of $4,172. The assessed value of the land and buildings after the plant has been completed has been estimated at $240.0 million, which, under current state, county, and school tax rates, would yield approximately $1.9 million annually in property tax revenues.

The impact of the plant on local property values near the site is not expected to be significant. The farmland in the immediate vicinity of the site is generally of medium quality and demand for such land is not strong nor are the prices high. Under these conditions, the removal of this land from the local supply of land would not drive up the price of similar land in the area.

The two principal forms of indirect costs arising from plant operation will be costs of community services required by the households of operating personnel transferred to the local area (most of whom are expected to locate in the Trimble County area) and costs arising from operation of the plant cooling system.

By 1989, when all four units are operating at the proposed plant, 350 people will be employed to operate and maintain the plant. It is estimated that as many as 190 operating personnel may ultimately relocate to Trimble County. On the basis of the Kentucky average-sized family in 1970 of 3.57 persons per household, this will result in 570 people being relocated in Trimble County. Most are expected to locate in the Bedford area, although there are no overriding reasons to do so. The costs of adding these households to the city's utilities will be only moderate, since the plant employee families represent only a minimal increment to the total population served. The expenses incurred by Trimble County schools will probably be less than the revenue generated for them by the power plant and its personnel with their dependents. The county's excess of income from the plant could permit it to lower the tax rate as well as to enter into joint service arrangements with incorporated communities in the county.

The plant will produce some localized noise. Because the population is very sparse in the immediate site vicinity, and because measures to mitigate noise from the plant have been taken, the noise is not expected to be a major nuisance. The plant cooling system may generate some cold-weather fogging; this will not inconvenience a large number of persons because of the low-density resident population in the site area and the normally low level of traffic on roads passing near the site.

7.0 MITIGATIVE MEASURES

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7.0 MITIGATIVE MEASURES

The Applicant and the EPA have developed a set of measures to reduce identified adverse impacts of construction and operation of the Trimble County Generating Plant. These measures focus primarily on control of noise, dust, water, and air pollution. In addition, discharges from the runoff retention basin and the solid waste disposal ravines and flue gas emissions will be monitored.

Several of these mitigative measures have been formally established in a Stipulation (given as an attachment to the Draft EIS) agreed to by the Applicant and the EPA as the prerequisite to approval of an NPDES permit. Subsequent to this Stipulation, and after additional information was supplied to the EPA by the Applicant, effluent limitations and permit conditions were established and a draft NPDES permit was written for the proposed project (Appendix T).

7.1 NOISE CONTROL

Noise from construction equipment can be mitigated to some extent by the use of proper muffling devices on all engines. Construction management must make certain that Occupational Safety and Health Act standards are met by providing ear protection to workers when and where required.

A site arrangement study conducted by the design engineers included reduction of boundary noise as a major criterion for placement of various plant elements. On the basis of this criterion, cooling towers, main plant buildings, barge unloading facilities, and coal-handling equipment were located as far from Wises Landing as practical. For most principal noise sources, measures to reduce the noise will be taken. There will be individual treatment of exceptional noise-producing equipment. The main building, which houses the major equipment, will be enclosed with insulated metal siding. This feature will help considerably in reducing the level of noise emitted from the plant.

In addition to the design features incorporated into the plant to reduce the noise emitted, other steps will be taken to attenuate emitted sounds. After construction of the plant, the site will be landscaped and vegetated. During the construction phase, a vegetated berm will be constructed along Kentucky Highway 754. This berm will significantly reduce noise emissions from the plant. The natural and planned vegetation located on the site will absorb some of the noise, thereby reducing the noise level at and beyond the site boundary.

Dust collectors, discussed under "Dust Control," would also serve to limit noise emissions from coal unloading and transfer operations.

7.2 DUST CONTROL

The Applicant will minimize fugitive dust production on site by: (1) limiting clearing and grading operations to those areas essential to maintain construction sequence and schedule, (2) grassing disturbed areas as promptly as possible, and (3) using dust control or abatement measures on roadways or cleared areas.

Dust abatement procedures that could be used during construction include covering construction roads with a stone and petroleum base and spraying potentially dusty areas with water. The requirement will be greatest during summer months when the soil-evaporative stress is greatest.

The effects of construction equipment engine exhaust can be allayed by routine engine maintenance and tuning.

Control of fugitive dust from the handling and storage of coal and limestone will require a more extensive program. The primary means of controlling dust emissions from open bulk-material handling operations is the use of wet sprays. The sprays are most frequently water; however, in some circumstances, special surfactants are added to the water or a hydrocarbon-based liquid is used.

It is assumed that sprays would be used at the unloading facilities and coal and limestone piles as appropriate. At mechanical transfer points, the operations would be enclosed and dust-laden air would be filtered through bag-type filters.

Dusting prevention at the coal and limestone piles is achieved by management of the material pile. This entails careful compaction of the pile surface at the time of material storage and, under some conditions, "skimming" with hydrocarbon-based materials.

At the pug mill, a small quantity of conveying air will need to be vented. If mixing of the sludge cake with the fly ash and fixation agent is sufficiently complete, this air can be vented through the mill itself. Otherwise, a spray for dust suppression will be introduced at the discharge from the mill.

7.3 WATER POLLUTION CONTROL

Measures to protect the water and associated aquatic life from damage by the plant are the stormwater runoff retention system, sanitary facilities and waste treatment, and closed cycle plant water system. The following are additional measures that will be employed.

7.3.1 Erosion Control

The following construction practices will be used to reduce erosion and provide sediment control during construction.

1. As much natural ground cover as possible will be retained and protected; areas where cover is removed will be seeded with fescue (sloped areas) or rye (in areas requiring immediate erosion control)

2. Where possible, work will proceed in small units, exposing a minimum of surficial area to soil erosion

3. Structures and final grading and surface protection will be completed as quickly as possible

4. Where it is necessary to delay completion, temporary seeding or mulching will be used to control erosion

5. Moderate slopes will be used to reduce the velocity of runoff and to facilitate the establishment and maintenance of a good ground cover

6. Runoff will be diverted away from excavations, embankments, and other exposed surfaces by means of temporary berms, dikes, and slope drains as required

7. Major earthwork will be scheduled during the summer months. This period allows the establishment of healthy vegetation and historically has the least amount of rainfall

8. Impounded water will be used for construction purposes as much as practicable

9. In the ravine areas, where possible, tree stumps and roots and ground cover vegetation will not be removed. Tree clearing will be selective and progressive; the tops of the ridges will not be cleared

10. Riprapping of vegetation will be used to stabilize the banks of the relocated Corn Creek channel as well as the dikes and banks along the Ohio

7.3.2 Accidental Leakage and Spillage Control

Leakage and spillage could cause significant short-term deterioration of the water quality and the elimination of large quantities of aquatic biota at and downstream of the spill. In order to protect the environment from accidental spillage of materials (coal, fuel oil, limestone, chemicals) barged to the Trimble County Generating Plant, the following plans have been made.

All coast guard regulations dealing with oil transfer facilities and operation will be complied with; an operations manual for the facility will be prepared and submitted to the captain of the port of Louisville, Kentucky. A spill prevention control and countermeasure plan will describe spill prevention measures.

A floating boom will be used to contain any oil that might be spilled during barge unloading. A motorized work barge with an oil skimmer will be used if oil cleanup operations are necessary. Facilities for the unloading of chemicals will be designed to minimize the possibility of spills. A containment system will be built around the oil storage facilities on land. Tanks and diking will be constructed in accordance with American Petroleum Institute standards. Dikes will be sized to contain at least 110 percent of the capacity of the largest tanks and will be provided with concrete sumps. Any water collected in the sumps will be pumped to an oil separator for recovery of the oil and reuse of the water.

7.3.3 Ground Water Protection Measures

In order to prevent contamination of ground water by fuel and chemical stockpiles and by solid waste disposal, the Applicant will take the following two precautions:

1. Solid waste (fly ash and scrubber sludge) will be rendered stable, impermeable, and nonleachable, if possible, by means of a chemical stabilization process

   Disposal of the stabilized solid waste will be phased. During the first 2 years of plant operations, a test disposal process will be used. At the mouth of one of the smaller ravines leading into Ravine RB, a dam to control runoff will be constructed. The sludge/ash mixture will be terraced behind the dam. Runoff will be monitored and, depending on its condition, either (a) discharged directly to Corn Creek, (b) treated and returned to Corn Creek, or (c) recycled. This test disposal process will provide data on which to establish the procedure for developing the remaining disposal areas, including the extent of required monitoring of ground water and runoff

2. In lieu of a satisfactory stabilization process or of proven long-term reliability, a suitable off-site disposal area will be selected by the Applicant. A complete environmental analysis (EIA) of the site will be performed and presented to the EPA and the Commonwealth of Kentucky. The EIA will include detailed descriptions of the entire process, including: transport, control of surface runoff, control of leachate, and a complete delineation of impact to the natural and human environments

3. All fuel, chemical, and onsite waste disposal areas will have engineered containments featuring impermeable liners and dikes of sufficient size to provide protection from flooding, and containment of spills or runoff water. The waste disposal areas have a combined 30-year disposal capacity

7.4 AIR POLLUTION MITIGATION

Measures to mitigate the emission of pollutants from the plant are described in Sections 3.4 and 4.2 of the Draft EIS. These include: natural draft cooling towers, the SO_2 scrubber system, and the electrostatic precipitators.

In the event a flue gas desulfurization (FGD) system becomes inoperative, the Applicant will take measures to operate the unit(s) within the applicable significant deterioration increments in effect at the time of issuance of the PSD approval to construct.

1. The Applicant will maintain, onsite, a 30-day supply of alternate coal of a quality that will permit operation of one unit within the above stated limitation when an FGD system is out of service.

2. The Applicant will burn the alternate supply of coal and/or follow other operating procedures designed to operate the station within the above stated limitation when an FGD system is out of service.

After 12 months of FGD system operating experience, the Applicant will submit to the Regional Administrator for review and approval a long-term operating procedure and malfunction contingency plan for the operation of the station.

Fuel oil tanks will be equipped with floating roofs, vapor conservation vents, and flame arresters.

7.5 OTHER MITIGATIVE MEASURES

7.5.1 Navigational Warnings

Navigation lights and required navigation warnings will be provided for the mooring cells in the Ohio River. Barges moored at the cells will cause little interference with river traffic. Two large tows will extend approximately 200 feet from the mooring cells into the channel; the barges will be approximately 1,000 feet from the center of the channel.

7.5.2 Measures to Protect Aquatic Life

Although the relocation of Corn Creek will diminish the backwater area as a habitat for Ohio River fish, habitat improvements can be provided to enhance the new Corn Creek channel, if required. Fish, water quality, and benthic samples have been taken in the existing backwater areas to assess the present value of habitat in cooperation with state and federal wildlife agencies. This will allow for joint determination of appropriate measures and cost for fishery management or improvement.

The Applicant assumes responsibility for clean-up of all spills to the Ohio River resulting from barge loading or unloading operations involving oil, coal, desulfurization reactants, or other chemicals used at the facility. Oil pollution prevention procedures as stated in 40 CFR Part 112 will be followed.

Intake velocity at the intake structure screen will not exceed 0.5 feet per second.

7.6 MONITORING PROGRAMS

7.6.1 Ground Water Monitoring

The Applicant will implement a ground water monitoring program. Monitoring of the ground water downgradient of the onsite bottom ash and emergency fly ash and scrubber sludge disposal pond, as well as coal storage areas, will be performed monthly. Quarterly reports will be submitted to the EPA and the Commonwealth of Kentucky. Applicable EPA-approved methods will be used to determine, to the limits of detection, the following constituents in the ground water: copper, iron, lead, mercury, nickel, selenium, sulfide-sulfite-sulfate compounds, and total suspended solids.

The EPA will be informed of any proposed changes to the monitoring program. The EPA may require additional monitoring, if warranted, following the placement of additional units on the site or following the initiation of use of new areas for coal storage or ash or sludge disposal ponds. If leachate is suspected, ground water monitoring in the ravines may be required.

Should the quarterly reports demonstrate significant contamination of ground water, the Applicant will implement measures to mitigate such contamination and to assure that no future contamination will occur. Those measures acceptable to EPA may include but not be limited to: sealing, relocating, or altering operations of the ash or sludge disposal ponds and/or coal storage area.

7.6.2 Water Discharge Monitoring

Water discharges from Ravines RA and RB will be monitored, as will also water discharged from the runoff retention basins, to ensure that discharge meets applicable federal and state water quality requirements. Water discharge monitoring requirements are described in the draft NPDES permit appended to this report.

7.6.3 Flue Gas Emissions Monitoring

In-stack monitors will be used to measure flue gas emissions in accordance with state and federal monitoring regulations.

7.7 TRANSMISSION LINE MITIGATIVE MEASURES

Transmission line corridors in Indiana will be selected on the basis of minimizing clearing and reducing the number of stream crossings. Only unavoidable crossings will be made. Clearing will be selective. Where possible, streams will be crossed at narrow points and the line will cross perpendicularly. Transmission towers will be kept at least 50 feet from stream banks. Also, vegetation along stream banks will be left as is, if possible.

The following is a presentation of additional mitigative measures.

7.7.1 Construction Measures

After the initial mechanical clearing of the transmission line right-of-way, herbicides will be used on woody vegetation only. Maintenance use of herbicides will be limited to no more than one application in 5 years. When herbicides are required, their application will be limited to: (1) periods when the wind speed is less than 5 miles per hour, and (2) areas no closer than 500 feet from any streams. Clearing within the corridor will employ the selective basal cutting method rather than rooting and grubbing. Only "danger" trees bordering the right-of-way will be cut. Necessity for clearing will vary with terrain, but, on level areas, vegetation of a height not exceeding 20 feet when mature will be allowed underneath the lines.

Sensitive man-made or natural areas will be avoided to the maximum extent possible. When the final alignment is determined (prior to land acquisition for the Indiana Trimble County to Northside Substation), ground level surveys will be conducted along the corridor to definitively locate such areas, including archaeological sites potentially eligible for inclusion in the National Register of Historic Places. The archaeological survey will be closely coordinated with and reviewed by the state archaeologist.

The vegetative survey will be done along the entire corridor, and this work also will be coordinated with the state. Wildlife biologists and foresters with the Indiana Department of Natural Resources could help locate particular survey areas and suggest mitigative action, if needed.

The Applicant will limit, as much as possible, the number of access roads to the right-of-way. Also, vegetation which would provide visual barriers to transmission line corridors will be preserved. Replacement plantings will also be employed where needed in this respect.

7.7.2 Operation Measures

The Applicant will assume the cost of remedying any adverse effects on radio or television reception caused by its transmission lines.

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APPENDIX A

DAILY OPERATING (SPINNING) RESERVE

Load forecasts are based on, and loads as actually carried are reported on, the basis of integrated load over a 1-hour period. Actual loads at any moment will be more or less than the load integrated over the hour. Generation is actually dispatched, moment by moment, by maintaining a zero tie-line interchange flow (as adjusted for scheduled interchanges) plus a factor for compensating system frequency for any deviation above or below 60 HZ. In reality, then, the whole interconnected system is controlled, basically, by frequency. This is the way each system responds with its portion of spinning reserve to cover a loss of generation somewhere in the country until the affected company can make arrangements to pick up emergency capacity from one of its neighbors. That is, when a unit is lost, the frequency throughout the part of the country which is tied together drops a fraction of a cycle. In response, every system in the country "sees" the frequency drop, but does not know who is in trouble or why, and their automatic dispatch equipment opens the throttle on each of their generators until enough additional generation is loaded throughout the country to make up the loss.

Therefore, spinning (or daily operating) reserve provided by each system is designed to: (1) carry the swings in internal loads above the integrated hourly load, and (2) respond to frequency variations resulting from upsets in the balance of load and generation that may occur from moment to moment from causes anywhere in the interconnected systems.

A review of historical operating data indicates that an average of 10 to 15 percent of the installed generating capacity throughout the system comprising a coordinated geographical area can be expected to be unavailable to meet load demands due to forced outages and derating at any time.

APPENDIX B

Table 1

MAJOR INDUSTRIAL LOAD GROWTH (50-PERCENT POTENTIAL AVERAGE PEAK)[a] LOUISVILLE GAS AND ELECTRIC COMPANY

			Total	
Year	Big Four[b]	Other[c]	Actual or Forecast	Historical Data Base[d]
1965	184 MW	101 MW	285 MW	284 MW
1966	190 MW	110 MW	300 MW	296 MW
1967	177 MW	120 MW	297 MW	310 MW
1968	200 MW	130 MW	330 MW	324 MW
1969	205 MW	142 MW	347 MW	338 MW
1970	202 MW	155 MW	357 MW	354 MW
1971	196 MW	169 MW	365 MW	369 MW
1972	204 MW	171 MW	375 MW	386 MW
1973	196 MW	209 MW	405 MW	403 MW
1974	198 MW	232 MW	430 MW	422 MW
1975	146 MW	239 MW	385 MW	441 MW
1976	147 MW	253 MW	400 MW	460 MW
1977			408 MW	481 MW
1978			416 MW	503 MW
1979			429 MW	525 MW
1980			442 MW	549 MW
1981			459 MW	574 MW
1982			478 MW	600 MW
1983			497 MW	627 MW
1984			517 MW	655 MW
1985			538 MW	684 MW
1986			559 MW	715 MW
1987			581 MW	747 MW
1988			604 MW	781 MW
1989			628 MW	816 MW
1990			653 MW	853 MW

Correlation Coefficient = .9852

---

[a] See Section 1.4.2.

[b] Airco, General Electric, du Pont, and International Harvester; these account for roughly 50 percent of Applicant's major industrial load.

[c] See discussion in Section 1.4.4 .

[d] Increase that would have been expected on basis of previous historical growth of peak load.

APPENDIX B

Table 2

NON-INDUSTRIAL BASE LOAD GROWTH (50-PERCENT POTENTIAL AVERAGE PEAK)[a] LOUISVILLE GAS AND ELECTRIC COMPANY

Year	Actual or Forecast	Historical Data Base[b]
1965	389 MW	374 MW
1966	411 MW	404 MW
1967	435 MW	437 MW
1968	442 MW	472 MW
1969	507 MW	511 MW
1970	553 MW	552 MW
1971	597 MW	592 MW
1972	664 MW	645 MW
1973	683 MW	697 MW
1974	770 MW	754 MW
1975	745 MW	815 MW
1976	832 MW	881 MW
1977	865 MW	952 MW
1978	909 MW	1,030 MW
1979	963 MW	1,113 MW
1980	1,030 MW	1,203 MW
1981	1,102 MW	1,300 MW
1982	1,191 MW	1,406 MW
1983	1,286 MW	1,520 MW
1984	1,386 MW	1,643 MW
1985	1,490 MW	1,776 MW
1986	1,598 MW	1,920 MW
1987	1,710 MW	2,075 MW
1988	1,825 MW	2,243 MW
1989	1,944 MW	2,425 MW
1990	2,065 MW	2,621 MW

Correlation Coefficient = .9947

---

[a] See Section 1.4.2.

[b] Increase that would have been expected on basis of previous historical growth of peak load.

APPENDIX B

Table 3

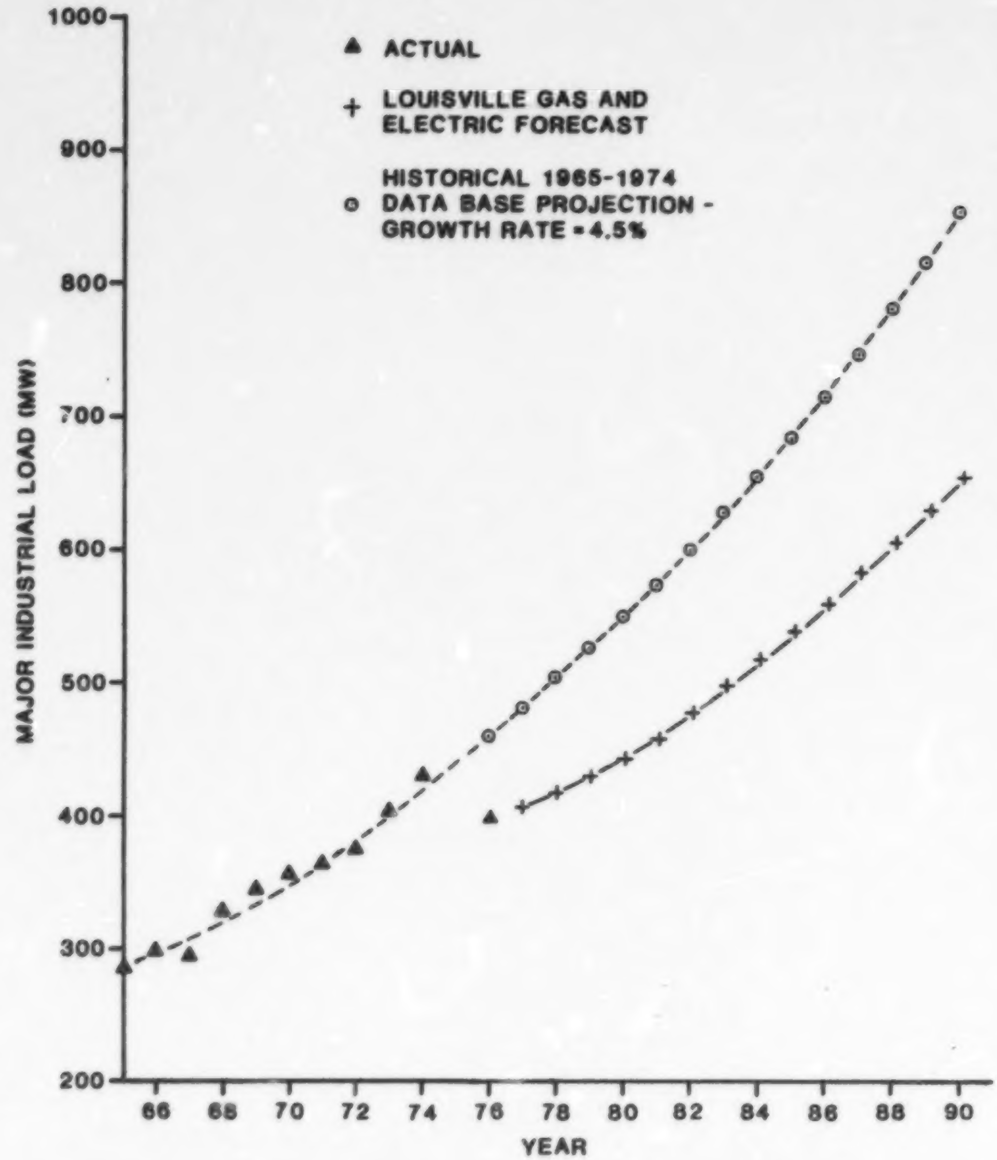
TEMPERATURE-SENSITIVE LOAD GROWTH (50-PERCENT POTENTIAL AVERAGE PEAK)[a]
LOUISVILLE GAS AND ELECTRIC COMPANY

Year	Actual or Forecast	Historical Data Base[b]
1965	122 MW	122 MW
1966	176 MW	176 MW
1967	222 MW	222 MW
1968	316 MW	275 MW
1969	262 MW	310 MW
1970	350 MW	350 MW
1971	408 MW	385 MW
1972	394 MW	420 MW
1973	483 MW	455 MW
1974	467 MW	485 MW
1975	520 MW	520 MW
1976	475 MW	550 MW
1977	499 MW	580 MW
1978	519 MW	610 MW
1979	541 MW	640 MW
1980	565 MW	665 MW
1981	590 MW	695 MW
1982	615 MW	725 MW
1983	639 MW	750 MW
1984	661 MW	780 MW
1985	680 MW	810 MW
1986	698 MW	835 MW
1987	714 MW	865 MW
1988	732 MW	890 MW
1989	749 MW	920 MW
1990	765 MW	945 MW

---

[a] See Section 1.4.2.

[b] Increase that would have been expected on basis of previous historical growth of peak load.



SOURCE: LOUISVILLE GAS AND ELECTRIC CO., 1976

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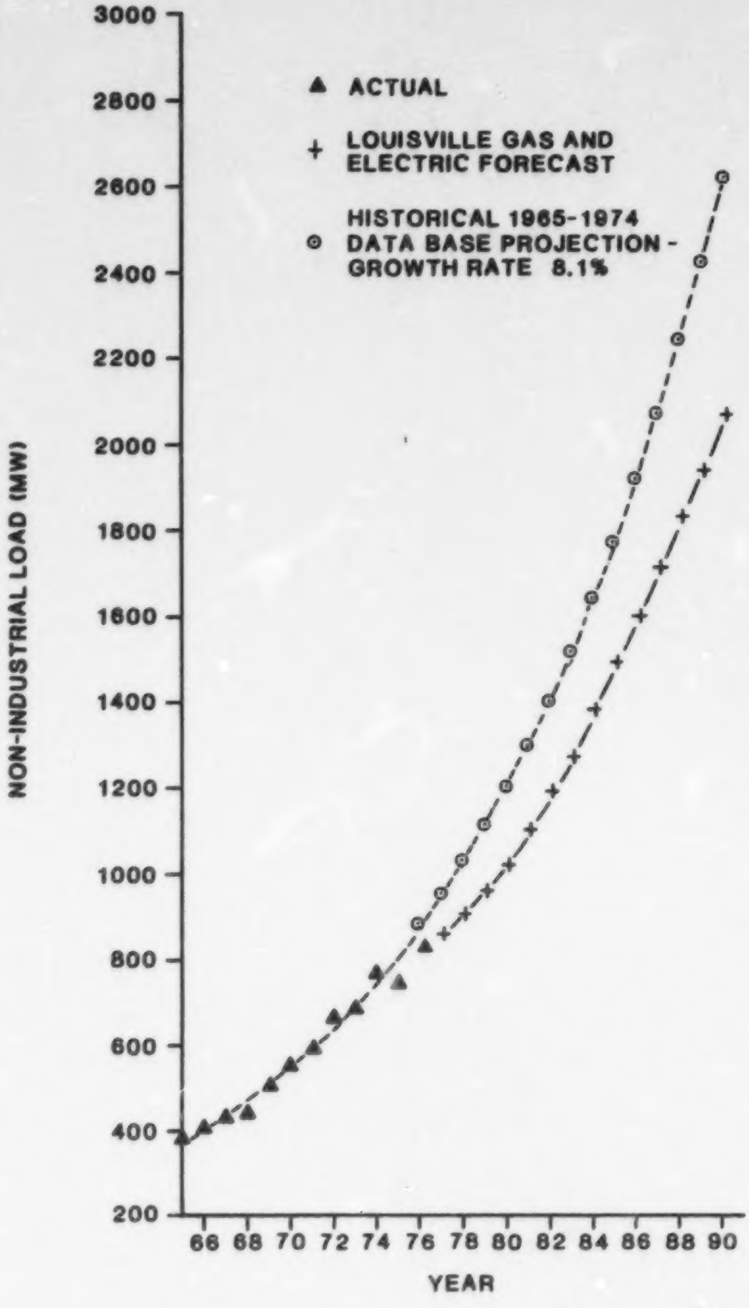
NOTE:
50% POTENTIAL
AVERAGE PEAK

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

MAJOR INDUSTRIAL
LOAD GROWTH

FIGURE 1



SOURCE: LOUISVILLE GAS AND ELECTRIC CO., 1976

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

NON-INDUSTRIAL BASE

LOAD GROWTH AT 70° F

FIGURE 2

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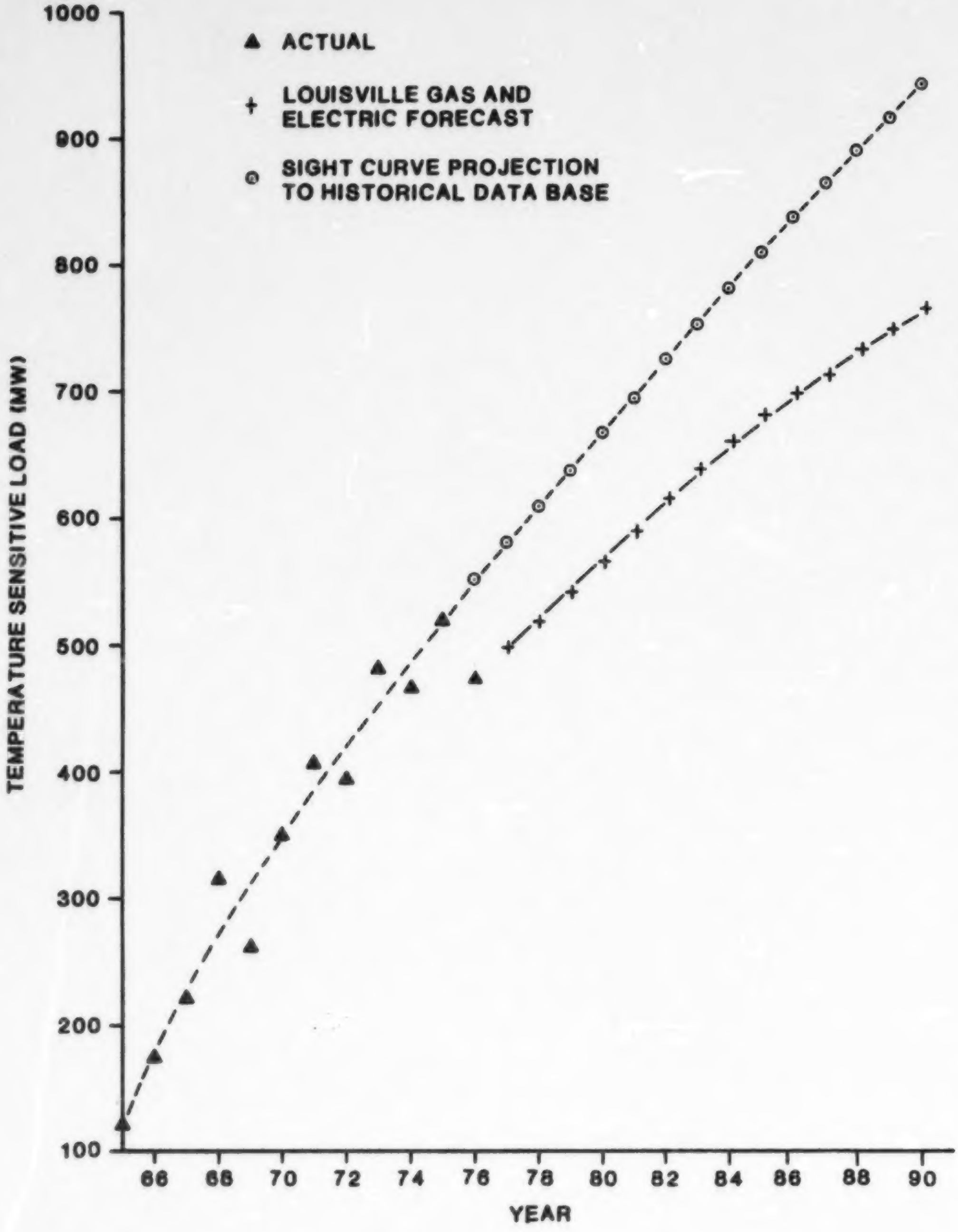

SOURCE: LOUISVILLE GAS AND ELECTRIC CO., 1976

LOUISVILLE GAS & ELECTRIC CO.
TRIMBLE COUNTY GENERATING PLANT

TEMPERATURE-SENSITIVE

LOAD GROWTH AT 86° F

FIGURE 3

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APPENDIX C

CONTINUOUS DAILY STREAMFLOW GAGING STATIONS IN AND NEAR SERVICE AREA

Station Number	Station Name	Drainage Area (sq mi)	Period of Record		Maximum Instantaneous Discharge			Minimum Discharge		Average Discharge		7-Day 10-Year Low Flow (cfs)
			Span of Years	No. of Years	Flow (cfs)	Stage (msl)	Date	Flow (cfs)	Stage (msl)	(cfs)	(inch/ year)	
2905	Kentucky R. at Lock 2	6,180	1925-1973	48	123,000	490.2	1-26-37	a	a	8,133	17.87	b
2920	Ohio R. at Madison, Ind.	90,580	1939-1946	7								
2924.6	Harrods Cr. nr. LaGrange, Ky.	24.1	1967-1973	7	5,320	672.5	6-20-73	0.04	b	39.6	22.31	0.2
2925	S. Fork Beargrass Cr. at Louisvl.	17.2	1939-1973	21[c]	4,940	462.8	3-9-64	0	b	21.4	16.90	0
2930	Mdl. Fork Beargrass Cr. at Louisvl.	18.9	1944-1973	29	5,200	485.0	4-2-70	0	b	24.8	17.82	0.1
2935	Mdl. Fork Beargrass Cr. at Louisvl.	24.8	1939-1940	2								
2945	Ohio R. at Louisville, Ky.	91,170	1928-1973	45	1,110,000	459.4	1-27-37	2,100	b	112,300	16.73	14,300
2960	Plum Cr. No. 4 at Simpsonville, Ky.	1.55	1954-1964	10								
2965	Plum Cr. nr. Wilsonville, Ky.	19.1	1954-1961	8								0
2967	Plum Cr. No. 5 (Little Plum Cr.)	1.03	1957-1961	5								
2968	Plum Cr. No. 17 nr. Waterford, Ky.	0.52	1957-1961	5								
2970	Little Plum Cr. nr. Waterford, Ky.	5.15	1954-1961	8								0
2975	Plum Cr. at Waterford, Ky.	31.8	1954-1973	19	13,200	491.5	6-23-60	0	b	40.6	17.34	0
2980	Floyd's Fork at Fisherville, Ky.	138	1944-1973	29	28,500	558.2	4-2-70	0	b	168	16.53	0
2985	Salt R. at Shepherdsville, Ky.	1,197	1938-1973	35	78,200	448.1[d]	3-10-64	0	b	1,516	17.20	c
3015	Rolling Fork nr. Boston, Ky.	1,299	1938-1973	35	50,500	451.4	4-30-70	0.4	b	1,705	17.82	1.7
3020	Pond Cr. nr. Louisville, Ky.	64	1944-1973	29	8,020	453.1	3-9-64	0	b	85.2	18.08	b
3103	Nolin R. at White Mills, Ky.	357	1959-1973	14	19,400	617.9	4-29-70	31	584.6	458	17.42	34

---

[a] Not determined
[b] Not available
[c] Records not complete for all years
[d] Maximum stage 453.9, 1-25-37 (Ohio River backwater)

Source: Swisshelm, 1974, and Dames & Moore, 1975.

APPENDIX D

Table 1

RECENT WATER QUALITY DATA, OHIO RIVER NEAR TRIMBLE COUNTY PLANT SITE

Parameter	Concentration[a] (Maximum)	Concentration[a] (Minimum)
Silica (SiO_2)	-	-
Calcium (Ca)	52.3	25.0
Magnesium (Mg)	14.4	8.7
Bicarbonate (HCO_3)	-	-
Carbonate (CO_3)	-	-
Alkalinity, as $CaCO_3$	-	-
Sulfate (SO_4)	119	56.6
Dissolved solids	330	164
Hardness (Ca, Mg)	191	98
Non-carbonate hardness	130	49
Specific conductance[b]	650	270
pH[c]	8.7	7.6
Temperature[d]	83	-

---

[a] Mg/l unless noted otherwise
[b] Micromhos/cm at 25°C
[c] Standard units
[d] Degrees F

Source: University of Louisville, 1976

APPENDIX D

Table 2

RECENT WATER QUALITY DATA, KENTUCKY RIVER AT LOCK NO. 2

Parameter	Concentration[a] (Maximum)	Concentration[a] (Minimum)
Silica (SiO_2)	6.4	5.0
Calcium (Ca)	40	32
Magnesium (Mg)	7.4	3.9
Bicarbonate (HCO_3)	112	76
Carbonate (CO_3)	-	-
Alkalinity, as $CaCO_3$	92	71
Sulfate (SO_4)	39	26
Dissolved solids	172	136
Hardness (Ca, Mg)	130	96
Non-carbonate hardness	44	26
Specific conductance[b]	360	100
pH[c]	7.7	6.5
Temperature[d]	83	39

---

[a] Mg/l unless noted otherwise
[b] Micromhos/cm at 25°C
[c] Standard units
[d] Degrees F

Source: U.S. Geological Survey, 1974b

APPENDIX D

Table 3

RECENT WATER QUALITY DATA, HARRODS CREEK NEAR LAGRANGE, KENTUCKY

Parameter	Concentration[a] (Maximum)	Concentration[a] (Minimum)
Silica (SiO_2)	-	-
Calcium (Ca)	-	-
Magnesium (Mg)	-	-
Bicarbonate (HCO_3)	216	190
Carbonate (CO_3)	0	0
Alkalinity, as $CaCO_3$	-	-
Sulfate (SO_4)	31	25
Dissolved solids	215	220
Hardness (Ca, Mg)	190	200
Non-carbonate hardness	34	23
Specific conductance[b]	704	287
pH[c]	7.9	7.7
Temperature[d]	81	32

---

[a] Mg/l unless noted otherwise
[b] Micromhos/cm at 25°C
[c] Standard units
[d] Degrees F

Source: U.S. Geological Survey, 1974b

APPENDIX D

Table 4

RECENT WATER QUALITY DATA, SALT RIVER AT SHEPHERDSVILLE, KENTUCKY

Parameter	Concentration[a] (Maximum)	Concentration[a] (Minimum)
Silica (SiO_2)	3.3	3.3
Calcium (Ca)	61	61
Magnesium (Mg)	11	11
Bicarbonate (HCO_3)	236	184
Carbonate (CO_3)	8	0
Alkalinity, as $CaCO_3$	-	-
Sulfate (SO_4)	41	36
Dissolved solids	306	236
Hardness (Ca, Mg)	200	230
Non-carbonate hardness	40	34
Specific conductance[b]	446	392
pH[c]	8.4	7.7
Temperature[d]	87	32

---

[a] Mg/l unless noted otherwise
[b] Micromhos/cm at 25°C
[c] Standard units
[d] Degrees F

Source: U.S. Geological Survey, 1974b

APPENDIX D

Table 5

RECENT WATER QUALITY DATA, ROLLING FORK NEAR BOSTON, KENTUCKY

Parameter	Concentration[a] (Maximum)	Concentration[a] (Minimum)
Silica (SiO_2)	-	-
Calcium (Ca)	-	-
Magnesium (Mg)	-	-
Bicarbonate (HCO_3)	185	185
Carbonate (CO_3)	7	7
Alkalinity, as $CaCO_3$	-	-
Sulfate (SO_4)	22	22
Dissolved solids	206	206
Hardness (Ca, Mg)	108	108
Non-carbonate hardness	17	17
Specific conductance[b]	354	354
pH[c]	8.5	8.5
Temperature[d]	76	37

---

[a] Mg/l unless noted otherwise
[b] Micromhos/cm at 25°C
[c] Standard units
[d] Degrees F

Source: U.S. Geological Survey, 1974b

APPENDIX D

Table 6

RECENT WATER QUALITY DATA, GREEN RIVER AT LOCK NO. 2[e]

Parameter	Concentration[a] (Maximum)	Concentration[a] (Minimum)
Silica (SiO_2)	-	-
Calcium (Ca)	-	-
Magnesium (Mg)	-	-
Bicarbonate (HCO_3)	111	70
Carbonate (CO_3)	0	0
Alkalinity, as $CaCO_3$	-	-
Sulfate (SO_4)	38	55
Dissolved solids	204	172
Hardness (Ca, Mg)	140	110
Non-carbonate hardness	49	49
Specific conductance[b]	300	300
pH[c]	8.0	8.0
Temperature[d]	88	40

---

[a] Mg/l unless noted otherwise
[b] Micromhos/cm at 25°C
[c] Standard units
[d] Degrees F
[e] Some data from samples taken at Lock No. 1

Source: U.S. Geological Survey, 1974b

APPENDIX D

Table 7

SUMMARY OF WATER QUALITY STANDARDS RELEVANT TO POWER PLANT SUPPLY AND DISCHARGE

---

1. Temperature - Allowable heat discharge rate (Btu/sec) = 62.4 X river flow (cfs) x (T_a - T_r) 90 percent

Where: T = allowable maximum temperature (°F) in the river as specified in the following list:

	T_a		T_a
January	50	July	89
February	50	August	89
March	60	September	87
April	70	October	78
May	80	November	70
June	87	December	57

T_r = river temperature (daily average in °F) upstream from the discharge

River flow = measured flow but not less than the critical flow value that is defined as the minimum daily flow, once in 10 years recurrence interval

Note: The above maximum monthly temperatures are applicable to the Ohio River. Standards applicable to Kentucky streams are identical except for July and August for which T_a = 90°F. Calculated on the basis of discharge volume and temperature differential, the increase in receiving water temperatures should not exceed the amount calculated by the above formula, provided, however, that in no case shall the aggregate heat discharge rate be of such magnitude as will result in a calculated increase in river temperature of more than 5°F.

2. Dissolved Solids Concentration - Dissolved solids concentration criteria are specified in terms of a maximum monthly average value and by a maximum instantaneous value. In addition, a companion criterion for specific conductance is specified by relating it to dissolved solids by a factor of 1.6, as explained previously. Thus, the water quality criteria are as follows:

Parameter	Maximum Monthly Average	Maximum Instantaneous
Dissolved solids (mg/l)	500	750
Specific conductance (micromhos/cm)	800	1,200

Table 7 (Continued)

---

3. Hydrogen-Ion Concentration (pH) - The limit for the hydrogen-ion concentration is such that the pH shall not be less than 5.0 nor greater than 9.0.

Source: Harton, n.d., and Ohio River Valley Water Sanitation Commission, 1970

APPENDIX D

Table 8

SIGNIFICANCE OF SELECTED WATER QUALITY PARAMETERS FOR POWER PLANT WATER USE

Silica (SiO_2)	Forms hard scale in pipes and boilers. Carried over in steam of high pressure boilers to form deposits on blades of steam turbines
Calcium (Ca)	Causes much of the hardness and scale-forming properties of water
Magnesium (Mg)	Causes much of the hardness and scale-forming properties of water
Bicarbonate (HCO_3)	Bicarbonates of calcium and magnesium decompose in steam boilers and hot water facilities to form scale and release corrosive carbon-dioxide gas
Carbonate (CO_3)	In combination with calcium and magnesium causes carbonate hardness
Alkalinity, as ($CaCO_3$)	Indicative of the presence of bicarbonate and carbonate
Sulfate (SO_4)	Sulfate in water containing calcium forms hard scale in steam boilers
Dissolved Solids	Important parameter in meeting water quality standards and criteria
Hardness (Ca, Mg)	Hard water forms scale in boilers, water heaters, and pipes. Waters of hardness up to 60 mg/l are considered soft; 61 to 120 mg/l, moderately hard; 121 to 200 mg/l, hard; more than 200 mg/l, very hard
Non-Carbonate Hardness	Any hardness in excess of that equivalent to the bicarbonate and carbonate hardness is called non-carbonate hardness
Specific Conductance	Indicator of the presence of dissolved solids in water. Generally accepted ratio of specific conductance to dissolved solids for Ohio River and tributaries is 1.6 (Harton, n.d.)

Table 8 (Continued)

pH	- A pH of 7.0 indicates neutrality; higher values indicate alkalinity; lower values indicate acidity. Corrosiveness of water generally increases with decreasing pH. However, excessively alkaline waters may also attack metals. pH is an important parameter of water quality standards
Temperature	- Important parameter of water quality standards

Source: Collier, 1958

APPENDIX E

WATER USE IN SERVICE REGION

	1968-69 Water Use (mgd)			
	Public		Industrial	
County	Surface Water	Ground Water	Surface Water	Ground Water
Bullitt	0.52	-	0.32	-
Hardin	2.39	7.13	0.27	0.71
Henry	0.43	0.57	0.02	0.03
Jefferson	62.29	-	128.79	24.19
Meade	0.05	0.18	-	10.86
Oldham	-	.50	-	1.00
Shelby	0.77	-	0.25	-
Spencer	0.10	-	0.02	-
Trimble	-	0.13	-	0.01
Muhlenberg	1.05	0.10	4.13	0.01

Source: Mull, *et al.*, 1971

APPENDIX F

PROXIMATE ANALYSIS: ALSTON #1 RAW COAL

As-Received	As-Mined (Typical)	Expected (Range per 10,000-ton lot)	
Moisture	8.95	8.0	10.75
Ash	15.53	14.0	19.0
Volatile	30.77	29.0	33.0
Fixed Carbon	44.79	42.0	46.0
Btu	10837	10350	11000
Sulfur	4.29	3.75	5.5
M A F Btu	14349	14205	14420
Sulfur Forms (Dry Basis)			
Pyritic	3.01	2.0	4.0
Sulfate	0.14	0.05	0.30
Organic	1.66	1.4	2.3
Water Soluble Alkalies			
Na_2O	0.025	0.010	0.030
K_2O	0.005	0.001	0.010
Equilibrium Moisture	8.02	7.4	9.1
Grindability	50	48	55
Fusions (Reducing)			
I.D.	1940	1900	2000
H=W	2035	1975	2175
H=1/2W	2085	2000	2200
Fluid	2190	2100	2300
Fusions (Oxidizing)			
I.D.	2300	2200	2425
H=W	2330	2280	2525
H=1/2W	2425	2300	2550
Fluid	2490	2375	2600
Ultimate Analysis (Dry Basis)			
Carbon	67.15	64.0	70.0
Hydrogen	4.72	4.3	5.25
Nitrogen	1.28	0.6	1.5
Chlorine	0.04	0.03	0.06
Sulfur	4.81	4.1	6.0
Ash	17.06	15.5	20.5
Oxygen	4.94	3.8	6.2
Mineral Analysis (Ignited Base)			
Phosphorus pentoxide, P_2O_5	0.33	0.15	0.70
Silica, SiO_2	39.62	35.0	45.5
Ferric oxide, Fe_2O_3	26.05	20.0	28.0
Alumina, Al_2O_3	16.20	15.0	20.0
Titania, TiO_2	0.84	0.75	0.95
Lime, CaO	6.76	5.25	8.5
Magnesia, MgO	0.81	0.70	1.00

APPENDIX F (Continued)

As-Received	As-Mined (Typical)	Expected (Range per 10,000-ton lot)	
Mineral Analysis (continued)			
Sulfur trioxide, SO_3	6.23	4.0	7.0
Potassium oxide, K_2O	1.99	1.8	2.3
Sodium oxide, Na_2O	0.48	0.3	0.6
Undetermined	0.69	-	-
Alkalies as Na_2O	0.26	0.22	0.30
Base/Acid	0.64	0.60	0.70
Lbs Ash/M Btu	14.33	12.5	18.25
Slag Viscosity T_{250}	2234	2200	2250
Free Swelling Index	4.5	3.5	5.5

APPENDIX G

OTHER ALTERNATIVE SOLID WASTE DISPOSAL SCHEMES

In addition to the ash and scrubber sludge disposal methods described in Section 3.4.5, the following alternatives were considered:

1. Offsite hauling
2. Commercial utilization
3. Deep well injection
4. Alternative onsite and nearsite storage areas

Offsite Hauling

Offsite hauling of ash and scrubber sludge by barge, unit train, or truck was considered as an alternative for waste disposal. Hauling and handling operations would entail transferring these waste products to one or more of the following locations:

1. Coal mine
2. Limestone quarry
3. Ravines or ponds

Material handling, including transfer to and from vehicles, would be facilitated by slurrying the ash and scrubber sludge and pumping it through pipelines. The ash would be introduced into mine settling ponds through boreholes, dewatered, and allowed to set up as structural fill in excavated portions of the mine. The waste could be introduced in a similar manner into inactive areas of a limestone quarry. However, this alternative would require substantial additional quantities of water each year to produce the slurry necessary for transport to the mine or quarry.

The possibility of ground water contamination by trace elements and other compounds such as sulfates, sulfites, and phosphates would become greater if water from slurried ash infiltrated rock strata in the mine or quarry. Also, space might not be available for several years and some method of landfill would be needed during this time.

Present information is not sufficient to predict when, where, and if these pollutants would appear in springs or other surface waters. If the pollutants did appear, they could have adverse effects on wildlife, livestock, and aquatic life in rivers and streams near the ultimate disposal site.

In addition to the above, the economics of this alternative are prohibited.

The third possibility, transfer of material to ravines or ponds, merely shifts the problem to a remote location.

Commercial Utilization

In 1970, only about 7 percent of all fly ash produced by coal-burning power plants was actually sold--primarily for concrete structural fill, lightweight aggregate, raw material for cement, filler for bituminous products, and road-base materials. It is estimated that maximum potential use under current technology and associated market conditions is about 25 percent.

It is expected that the ash/sludge produced by the proposed facility would not be marketable in the near future due to the following:

1. Expected variation in composition of products resulting from coal composition changes during plant operation
2. Unfamiliarity with these materials
3. Excessive quantities of heavy metals, chlorides, nitrites, etc., in these materials
4. General inability to compete commercially with conventionally used materials

In any event, it is unlikely that the total amount of sludge produced could be disposed of in this manner; thus, some other method of disposal would also be required.

Deep Well Injection

Injection of ash/sludge slurries into deep wells is considered to be a last resort by the EPA (particularly because of possible decreasing injection rates as a function of time after start up).

Because other disposal methods were more practicable, this technique was eliminated from consideration.

Alternative Onsite and Nearsite Storage Areas

Other than the two ravines adjacent to the northeast corner of the site, there are no available alternative nearsite or onsite disposal areas.

APPENDIX H

Table 1

AVERAGE MONTHLY RELATIVE HUMIDITY (PERCENT) AT LOUISVILLE, KENTUCKY

	Average Humidity (Central Standard Time)			
Month	0000	0600	1200	1800
January	78	78	68	69
February	76	77	63	65
March	73	75	57	60
April	74	72	54	56
May	79	74	53	57
June	83	76	54	59
July	83	77	52	57
August	83	81	54	59
September	81	82	53	60
October	80	81	53	59
November	75	77	59	63
December	77	78	64	69
Annual	79	77	57	61

Source: Water Information Center, Inc., 1974

APPENDIX H

Table 2

AVERAGE MONTHLY RELATIVE HUMIDITY
(PERCENT) AT CINCINNATI, OHIO

Month	Average Humidity (Eastern Standard Time) 0100	0700	1300	1900
January	79	82	69	74
February	77	81	64	68
March	75	80	56	60
April	74	78	52	58
May	80	80	53	60
June	84	83	55	63
July	84	84	52	60
August	83	87	51	62
September	82	87	49	63
October	79	86	51	64
November	76	81	59	66
December	79	81	66	72
Annual	79	83	56	64

Source: Water Information Center, Inc., 1974

APPENDIX H

Table 3

AVERAGE MONTHLY PRECIPITATION (INCHES) AT LOUISVILLE AND CINCINNATI

Month	Monthly Precipitation	
	Louisville	Cincinnati
January	4.10	3.44
February	2.99	2.55
March	4.67	4.07
April	4.01	3.64
May	3.93	3.54
June	4.06	4.05
July	3.08	3.70
August	3.06	3.38
September	2.70	2.88
October	2.45	2.19
November	3.12	3.06
December	3.30	2.84
Annual	41.47	39.34

Source: Water Information Center, Inc., 1974

APPENDIX H

Table 4

PERCENTAGE FREQUENCIES OF WIND DIRECTION AND SPEED AT LOUISVILLE, KENTUCKY (1951-1960)[a]

Direction	Speed (mph) 0-3	4-7	8-12	13-18	19-24	25-31	32-38	>38	Total	Avg. Speed
N	1.0	2.6	3.0	1.6	.2	*			8.4	8.8
NNE	.4	1.3	1.4	.7	.1	*			3.8	8.8
NE	1.1	2.2	2.2	.8	*		*		6.3	7.8
ENE	.2	.7	.7	.3	*				2.0	8.3
E	.8	1.2	.8	.2	*				2.9	6.2
ESE	.4	.8	.4	.1	*				1.7	6.3
SE	2.6	4.4	2.2	.4	*	*	*		9.6	6.0
SSE	1.2	2.8	2.1	.8	.1	*	*		7.0	7.5
S	1.5	3.0	3.3	2.3	.5	.1	*	*	10.8	9.4
SSW	.3	1.1	2.0	2.0	.5	.1	*		6.0	11.8
SW	.7	1.9	2.9	2.5	.6	.1	*	*	8.7	10.8
WSW	.2	1.1	2.0	1.5	.2	.1	*	*	5.3	10.9
W	.5	1.3	1.7	1.1	.2	*	*		4.8	9.6
WNW	.3	1.1	1.8	1.7	.3	.1	*		5.2	11.3
NW	.7	1.8	3.0	2.6	.3	*	*		8.6	10.4
NNW	.2	.9	1.5	1.4	.2	*			4.2	10.8
Calm	4.7								4.7	
Total	16.9	28.2	31.0	20.0	3.2	.5	.1	*	100.0	8.8

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[a] Due to rounding error, row and column totals may not match figures exactly.

*Less than 0.05 percent

Source: U.S. Department of Commerce, 1963a

APPENDIX H

Table 5

PERCENTAGE FREQUENCIES OF WIND DIRECTION AND SPEED AT CINCINNATI, OHIO (1951-1960)[a]

	Speed (mph)									Avg.
Direction	0-3	4-7	8-12	13-18	19-24	25-31	32-38	>38	Total	Speed
N	.5	2.0	1.9	.7	*	*			5.2	8.2
NNE	.4	1.6	2.0	1.0	.1	*			5.1	9.0
NE	.7	2.3	2.2	.9	*				6.1	8.2
ENE	.5	2.0	2.0	.7	.1	*			5.3	8.2
E	.5	1.5	1.3	.3	*				3.6	7.5
ESE	.3	1.1	1.3	.4	*	*			3.1	8.2
SE	.4	1.2	1.3	.4	*	*			3.4	8.1
SSE	.3	1.2	1.7	.8	.1	*			4.0	9.3
S	.7	2.5	3.0	1.5	.2	.1	*		8.0	9.2
SSW	.6	2.8	4.9	3.7	1.0	.2	*	*	13.3	11.3
SW	.6	2.2	4.0	3.5	.8	.1	*		11.3	11.4
WSW	.3	1.4	2.8	2.5	.5	.1	*	*	7.6	11.7
W	.3	1.1	1.9	1.6	.3	.1	*		5.3	11.2
WNW	.3	1.3	2.3	2.2	.5	.1	*		6.6	11.5
NW	.3	1.2	1.7	1.2	.2	*			4.6	10.1
WNW	.2	1.1	1.4	.8	*	*			3.5	9.4
Calm	4.0								4.0	
Total	10.8	26.6	35.6	22.3	3.9	.7	.1	*	100.0	9.6

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[a] Due to rounding error, row and column totals may not match figures exactly.

*Less than 0.05 percent

Source: U.S. Department of Commerce, 1963b

APPENDIX H

Table 6

MONTHLY WIND DIRECTION FREQUENCY (PERCENT) AND AVERAGE WIND SPEED AT LOUISVILLE, KENTUCKY (1951-1960)

	Month											
Direction	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
N	8.9	7.8	7.2	8.6	8.2	7.2	8.4	11.4	11.1	10.7	5.8	5.4
NNE	3.4	3.9	3.4	3.4	3.3	3.5	4.7	5.5	5.1	4.3	2.1	3.0
NE	4.7	7.6	8.2	5.6	6.4	6.5	7.4	6.5	7.9	6.2	3.7	5.4
ENE	1.8	2.7	3.1	2.0	2.3	2.0	1.8	1.7	2.0	1.9	.7	1.7
E	2.2	2.9	4.0	3.0	3.1	3.3	3.3	3.0	2.7	2.6	1.6	2.7
ESE	1.2	1.8	2.0	2.0	1.8	1.6	1.7	1.6	2.0	1.4	1.2	1.9
SE	7.9	9.0	9.1	10.1	9.9	10.4	9.2	8.9	10.2	10.8	10.4	9.8
SSE	6.2	5.8	5.1	6.0	7.6	8.4	8.1	7.4	7.1	7.2	8.1	7.0
S	11.7	8.6	7.9	10.1	11.1	12.1	10.9	10.6	11.3	10.1	13.0	11.6
SSW	6.5	5.3	4.6	7.8	6.1	6.8	5.5	4.6	5.1	5.1	7.1	7.7
SW	8.2	7.8	7.2	10.0	10.1	10.5	10.0	7.8	7.0	7.1	9.2	9.6
WSW	5.7	5.1	5.5	6.2	6.0	5.4	5.9	4.5	3.4	3.3	6.1	5.9
W	5.1	5.7	6.4	4.8	5.0	4.5	4.1	4.1	2.8	3.9	6.0	5.5
WNW	6.8	7.3	7.8	5.9	4.8	3.5	2.9	2.9	2.7	3.9	7.4	6.4
NW	11.6	12.2	12.0	8.5	6.5	5.4	5.2	6.3	7.6	7.6	10.0	10.2
NNW	6.5	4.8	4.5	3.9	4.2	3.4	3.6	4.6	4.8	4.4	3.2	3.5
Avg. Speed (mph)	10.4	10.4	10.8	10.7	8.5	7.5	7.2	6.4	7.2	7.3	9.4	9.5

Source: U.S. Department of Commerce, 1963a

APPENDIX H

Table 7

MONTHLY WIND DIRECTION FREQUENCY (PERCENT) AND AVERAGE WIND SPEED AT CINCINNATI, OHIO (1951-1960)

	Month											
Direction	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
N	6.2	4.9	4.8	5.0	5.2	5.0	5.6	7.2	6.0	4.9	3.5	3.5
NNE	5.4	5.8	5.6	6.1	4.4	4.1	5.4	6.0	5.8	6.4	3.0	3.5
NE	4.3	5.2	6.3	5.2	6.2	5.8	7.2	8.5	9.2	8.2	3.0	4.2
ENE	3.7	6.0	6.5	4.5	6.1	4.7	6.8	6.3	6.8	6.1	2.8	3.1
E	2.9	3.9	4.0	3.3	3.9	4.1	4.6	3.9	4.7	3.5	1.8	2.5
ESE	2.4	3.2	3.1	3.5	3.2	3.8	3.5	3.0	4.2	2.9	1.6	2.8
SE	2.8	3.1	3.3	3.1	3.5	4.1	3.6	3.4	3.8	3.5	2.7	3.3
SSE	4.2	5.0	4.2	4.0	3.9	3.8	3.3	3.2	4.2	4.2	4.1	4.6
S	9.4	6.4	6.5	7.6	7.8	8.5	6.9	6.5	8.0	7.6	11.0	10.1
SSW	11.9	11.4	8.8	14.5	13.8	15.3	12.4	11.9	13.0	14.2	18.2	14.4
SW	10.1	8.7	9.6	12.4	11.2	13.2	12.6	11.0	9.7	10.9	12.6	13.7
WSW	8.3	7.4	7.8	8.2	9.0	8.2	7.5	5.8	4.8	5.3	9.6	9.2
W	6.7	7.3	7.4	5.5	4.6	3.7	3.7	3.4	2.9	3.7	7.3	7.1
WNW	8.5	9.9	10.1	7.3	5.7	4.4	4.1	4.2	3.7	5.1	8.4	8.4
NW	5.7	5.7	6.3	4.8	4.3	3.0	3.8	4.1	4.1	4.4	5.0	4.3
NNW	5.0	3.9	3.2	3.3	3.8	3.1	3.1	3.8	3.8	3.9	2.8	2.9
Avg. Speed (mph)	11.0	11.1	11.3	11.4	9.4	8.3	7.5	7.0	8.1	8.8	10.8	10.4

Source: U.S. Department of Commerce, 1963b

APPENDIX H

Table 8

ANNUAL WIND DIRECTION AND PASQUILL STABILITY CLASS FREQUENCY DISTRIBUTION (PERCENT) - 1964

Direction	Stability Class A	Stability Class B	Stability Class C	Stability Class D	Stability Class E	Total
N	0.2	0.5	0.8	3.5	2.8	7.8
NNE	0.1	0.3	0.7	2.0	1.9	5.0
NE	0.1	0.4	0.5	1.3	1.2	3.5
ENE	0.1	0.3	0.5	1.5	1.4	3.8
E	0.1	0.6	0.5	1.2	1.6	4.0
ESE	0.0	0.7	0.6	1.3	2.8	5.4
SE	0.1	0.9	0.9	2.1	4.5	8.5
SSE	0.0	0.7	0.7	1.8	4.7	7.9
S	0.0	0.7	1.3	5.9	7.3	15.2
SSW	0.1	0.4	0.7	4.4	1.4	7.0
SW	0.1	0.3	0.9	2.5	0.8	4.6
WSW	0.1	0.5	1.2	3.7	1.7	7.2
W	0.1	0.6	1.1	4.3	2.0	8.1
WNW	0.0	0.3	0.6	2.8	1.3	5.0
NW	0.1	0.3	0.4	2.5	1.1	4.4
NNW	0.0	0.3	0.4	1.3	0.6	2.6
Total	1.2	7.8	11.8	42.1	37.1	100.0

Source: U.S. Department of Commerce, 1964

APPENDIX H

Table 9

AVERAGE MIXING HEIGHTS AND AVERAGE MIXING LAYER WIND SPEEDS FOR HUNTINGTON, WEST VIRGINIA
(1960-1964)

Season	Mixing Height (meters)	Wind Speed ($m\text{-}sec^{-1}$)	Mixing Height (meters)	Wind Speed ($m\text{-}sec^{-1}$)
Winter	634	5.3	1079	6.4
Spring	721	5.5	1986	6.5
Summer	338	2.7	1641	4.3
Autumn	403	3.1	1340	4.9
Annual	524	4.2	1511	5.5

Source: Holzworth, 1972

APPENDIX I

DESCRIPTIONS OF SAMPLING LOCATIONS SHOWN IN FIGURE 5.2.4-1

AW - A line transect 673 feet long bearing 260° along a gentle slope from the road to the river. The route crosses old fields, fallow fields, or abandoned pastureland.

BW - A line transect 592 feet long bearing 250° down a gentle slope from the road to the river and crossing old fields, a corn field, a wet slough, and riverbank vegetation.

CW - A line transect 406 feet long bearing 240° across old cropland near an old house foundation and running from the western margin of a pond to the margins of the bottomland woods at the oxbow.

DE - Along a gravel road traversing the southeast-facing slopes of the upland woods.

R-1 - A reconnaissance route west near an old house foundation across old fields and along the margins of the southern remnants of bottomland woods, then across the western end of the woods and down the riverbank and along a sandy beach and adjacent riverbanks below the level of the fields. The margin of a small pond about 30 feet to the east of the road was also visited regularly.

R-2 - East southeast past a large pond on the northeast-facing slopes of the upland woods, to the top of the slope along the flats adjacent to cultivated fields and pastureland, then down the steep west-facing slopes of the upland woods.

R-3 - Up the steep southwest-facing slopes of the upland woods.

R-4 - East northeast along a dirt road passing old fields to the left and margins of a small stream or drainage ditch along the base of north-facing slopes of the upland woods, then across a stream and up a draw across pastureland to a road leading up into south-facing slopes of the upland woods. Also visited were the stream margins along the base of the south-facing slopes of the upland woods on the other side of the old field area.

I. Grassland surrounding a pond.

II. Southern remnant of the bottomland woods.

III. A wet slough.

IV. An area, 31,250 square feet in size, where an inventory was made of the trees of the slopes and the bottomland woods of the oxbow.

V. A draw at the base of south-facing slopes of the upland woods.

APPENDIX I (Continued)

VI. An old field.

VII. A moist field between the curve of the oxbow and the river.

VIII. A moist field surrounded by the bottomland woods of the oxbow.

IX. An area where the floodplain woods were sampled using the point-centered quarter method.

X. Woods along low-lying areas east and west of the road.

XI. Unimproved pastureland along the north-south axis of a ridge between upland woods areas.

XII. An area where the northwest-facing slopes of the upland woods were sampled using the point-centered quarter method.

APPENDIX J

PLANT SPECIES OF THE TRIMBLE COUNTY GENERATING PLANT SITE

Common Name	Scientific Name
Adder's-tongue	Erythronium americanum Ker.
Alfalfa	Medicago sativa L.
American elm	Ulmus americana L.
Appendaged waterleaf	Hydrophyllum appendiculatum Michx.
Asparagus	Asparagus officinalis L.
Aster	Aster sp.
Aster	Aster sp.
Avens	Geum vernum (Raf.) T. & G.
Barnyard grass	Echinochloa crus-galli (L.) Beauv.
Beech	Fagus grandifolia Ehrh.
Beef-steak plant	Perilla frutescens (L.) Britt.
Big shellbark hickory	Carya laciniosa (Michx. f.) Loud.
Bitter dock	Rumex obtusifolius L.
Bitternut hickory	Carya cordiformis (Wang.) K. Koch
Blackberry	Rubus sp.
Black cherry	Prunus serotina Ehrh.
Black-eyed susan	Rudbeckia hirta L.
Black locust	Robinia pseudoacacia L.
Black medick	Medicago lupulina L.
Black nightshade	Solanum nigrum L.
Black oak	Quercus velutina Lam.
Black walnut	Juglans nigra L.
Bladder-nut	Staphylea trifolia L.
Bloodroot	Sanguinaria canadensis L.
Blue ash	Fraxinus quadrangulata Michx.
Blue beech	Carpinus caroliniana Walt.
Blueberry	Vaccinium sp.
Blue-eyed grass	Sisyrinchium angustifolium Mill.
Blue-eyed Mary	Collinsia verna Nutt.
Bluegrass	Poa sp.
Blue lettuce	Lactuca floridana (L.) Gaertn.
Blue morning-glory	Ipomoea hederacea (L.) Jacq.
Blue phlox	Phlox divaricata L.
Blue vine	Ampelamus albidus (Nutt.) Britt.
Blue waxweed	Cuphea petiolata (L.) Koehne.
Bottle-brush grass	Hystrix patula Moench.
Bouncing Bet	Saponaria officinalis L.
Boxelder	Acer negundo L.
Broad-leaved arrowhead	Sagittaria latifolia Willd.
Brome grass	Bromus inermis L.
Brome grass	Bromus japonicus Thunb.
Brome grass	Bromus sp.
Buckthorn	Rhamnus carolinianus Walt.
Bugle-weed	Lycopus virginicus L.

APPENDIX J (Continued)

Common Name	Scientific Name
Bur-cucumber	Sicyos angulatus L.
Butterweed	Senecio glabellus Poir.
Calico aster	Aster lateriflorus (L.) Britt.
Carolina cranesbill	Geranium carolinianum L.
Carpet-weed	Mollugo verticillata L.
Catalpa	Catalpa speciosa Warder
Catnip	Nepeta cataria L.
Cat-tail	Typha latifolia L.
Celandine-poppy	Stylophorum diphyllum (Michx.) Nutt.
Chicory	Cichorium intybus L.
Chamomile	Anthemis cotula L.
Chinquapin oak	Quercus prinoides Willd.
Cinquefoil	Potentilla recta L.
Clammy ground-cherry	Physalis heterophylla Nees.
Clearweed	Pilea pumila (L.) Gray
Cleavers	Galium aparine L.
Cocklebur	Xanthium strumarium L.
Common burdock	Arctium minus Schk.
Common chickweed	Stellaria media (L.) Cyrill.
Common dandelion	Taraxacum officinale Weber
Common elder	Sambucus canadensis L.
Common fleabane	Erigeron philadelphicus L.
Common milkweed	Asclepias syriaca L.
Common morning-glory	Ipomoea purpurea (L.) Roth.
Common mugwort	Artemisia vulgaris L.
Common mullein	Verbascum thapsus L.
Coralberry	Symphoricarpos orbiculatus Moench.
Corn	Zea mays L.
Corn speedwell	Veronica arvensis L.
Cottonwood	Populus deltoides Marsh.
Creeping primrose-willow	Jussiaea repens L.
Crooked-stemmed aster	Aster prenanthoides Muhl.
Croton	Croton monanthogynus Michx.
Cut-leaved toothwort	Dentaria laciniata Muhl.
Day-flower	Commelina communis L.
Day-lily	Hemerocallis fulva L.
Deptford pink	Dianthus armeria L.
Ditch stonecrop	Penthorum sedioides L.
Dogwood	Cornus drummondii C.A. Meyer
Duckweed	Lemna sp.
Ebony spleenwort	Asplenium platyneuron (L.) Oakes
Eclipta	Eclipta alba (L.) Hassk.
Elephant's foot	Elephantopus carolinianus Willd.
Empress-tree	Paulownia tomentosa (Thunb.) Steud.
English plantain	Plantago lanceolata L.
Evening primrose	Oenothera biennis L.
False buckwheat	Polygonum scandens L.

APPENDIX J (Continued)

Common Name	Scientific Name
False indigo	Amorpha fruticosa L.
False nettle	Boehmeria cylindrica (L.) Sw.
False rocket	Iodanthus pinnatifidus (Michx.) Steud.
False Solomon's seal	Smilacina racemosa (L.) Desf.
Fescue	Festuca sp.
Fescue	Festuca sp.
Field-cress	Lepidium campestre (L.) R. Br.
Field speedwell	Veronica agrestis L.
Figwort	Scrophularia marilandica L.
Flowering dogwood	Cornus florida L.
Fog-fruit	Phyla lanceolata (Michx.) Greene
Fragrant sumac	Rhus aromatica Ait.
Fringed loosestrife	Lysimachia ciliata L.
Galingale	Cyperus sp.
Garlic-mustard	Alliaria officinalis Andrz.
Giant hyssop	Agastache nepetoides (L.) Kuntze
Giant ragweed	Ambrosia trifida L.
Grape	Vitis baileyana Munson.
Great lobelia	Lobelia siphilitica L.
Greek valerian	Polemonium reptans L.
Green foxtail	Setaria viridis (L.) Beauv.
Green violet	Cubelium concolor (Forst.) Raf.
Ground-ivy	Glecoma hederacea L.
Hackberry	Celtis occidentalis L.
Hairy buttercup	Ranunculus hispidus Michx.
Heath aster	Aster ericoides L.
Hedge-bindweed	Convolvulus sepium L.
Hedge-mustard	Sisymbrium officinale (L.) Scop.
Hedge-nettle	Stachys tenuifolia Willd.
Hedge-parsley	Torilis japonica (Houtt.) DC.
Henbit	Lamium amplexicaule L.
Hepatica	Hepatica acutiloba DC.
Hercules' club	Aralia spinosa L.
Hispid greenbrier	Smilax hispida Muhl.
Hoary basswood	Tilia neglecta Spach.
Hog-peanut	Amphicarpa bracteata (L.) Fern.
Honey-locust	Gleditsia triacanthos L.
Hop-hornbeam	Ostrya virginiana (Mill.) K. Koch
Hornwort	Cryptotaenia canadensis (L.) DC.
Horse-nettle	Solanum carolinense L.
Horseweed	Conyza canadensis (L.) Cronq.
Hydrangea	Hydrangea arborescens L.
Indian hemp	Apocynum cannabinum L.
Ironweed	Vernonia altissima Nutt.
Japanese clover	Lespedeza striata (Thunb.) H. & A.
Japanese honeysuckle	Lonicera japonica Thunb.
Jimson-weed	Datura stramonium L.
Joe-Pye weed	Eupatorium fistulosum Barratt.

APPENDIX J (Continued)

Common Name	Scientific Name
Johnson grass	Sorghum halepense (L.) Pers.
Kentucky coffee-tree	Gymnocladus dioica (L.) K. Koch
Knotweed	Polygonum glaucum Nutt.
Knotweed	Polygonum prolificum (Sm.) Robins
Knotweed	Polygonum sp.
Korean lespedeza	Lespedeza stipulacea Maxim.
Lady's thumb	Polygonum persicaria L.
Lamb's quarters	Chenopodium album L.
Larkspur	Delphinium tricorne Michx.
Late boneset	Eupatorium serotinum Michx.
Leaf-cup	Polymnia canadensis L.
Leafy-bracted beggar-ticks	Bidens tripartita L.
Love grass	Eragrostis poaeoides Beauv.
Mayapple	Podophyllum peltatum L.
Meadow rue	Thalictrum revolutum DC.
Mexican tea	Chenopodium ambrosioides L.
Millet	Setaria italica (L.) Beauv.
Mist-flower	Eupatorium coelestinum L.
Moneywort	Lysimachia nummularia L.
Monkey-flower	Mimulus alatus Ait.
Moonseed	Menispermum canadense L.
Motherwort	Leonurus cardiaca L.
Moth-mullein	Verbascum blattaria L.
Mouse-ear chickweed	Cerastium vulgatum L.
Multiflora rose	Rosa multiflora Thunb.
New England aster	Aster novae-angliae L.
Nodding bur-marigold	Bidens cernua L.
Nodding foxtail	Setaria faberii Herm.
Nodding thistle	Carduus nutans L.
Oats	Avena sativa L.
Ohio buckeye	Aesculus glabra Willd.
Orchard grass	Dactylis glomerata L.
Osage-orange	Maclura pomifera (Raf.) Schneid.
Ox-eye daisy	Chrysanthemum leucanthemum L.
Pale plantain	Plantago rugelii Decne.
Pale smartweed	Polygonum lapathifolium L.
Pale touch-me-not	Impatiens pallida Nutt.
Pale violet	Viola striata Ait.
Panic grass	Panicum sp.
Panic grass	Panicum sp.
Papaw	Asimina triloba (L.) Dunal.
Path rush	Juncus tenuis Willd.
Peach	Prunus persica (L.) Patsch.
Pecan	Carya illinoensis (Wang.) K. Koch
Pennsylvania smartweed	Polygonum pensylvanicum L.
Peony	Paeonia officinalis L.
Pepper-grass	Lepidium virginicum L.

Common Name	Scientific Name
Persimmon	Diospyros virginiana L.
Pigweed	Amaranthus hybridus L.
Pineapple-weed	Matricaria matricarioides (Less.) Porter
Pointed-leaved tick-trefoil	Desmodium glutinosum (Muhl.) Wood
Poison hemlock	Conium maculatum L.
Poison-ivy	Rhus radicans L.
Pokeweed	Phytolacca americana L.
Pondweed	Potamogeton sp.
Prickly lettuce	Lactuca scariola L.
Prickly mallow	Sida spinosa L.
Primrose-willow	Jussiaea leptocarpa Nutt.
Prostrate knotweed	Polygonum aviculare L.
Purple cress	Cardamine douglassii (Torr.) Britt.
Purple dead nettle	Lamium purpureum L.
Purpletop	Triodia sp.
Purslane speedwell	Veronica peregrina L.
Ragweed	Ambrosia artemisiifolia L.
Redbud	Cercis canadensis L.
Red cedar	Juniperus virginiana L.
Red clover	Trifolium pratense L.
Red elm	Ulmus rubra Muhl.
Red mulberry	Morus rubra L.
Red sorrel	Rumex acetosella L.
Rue anemone	Anemonella thalictroides (L.) Spach.
St. John's-wort	Hypericum sp.
Sassafras	Sassafras albidum (Nutt.) Nees.
Scouring rush	Equisetum arvense L.
Sedge	Carex sp.
Self-heal	Prunella vulgaris L.
Service-berry	Amelanchier arborea (Michx. f.) Fern.
Sessile trillium	Trillium sessile L.
Shagbark hickory	Carya ovata (Mill.) K. Koch
Shepherd's purse	Capsella bursa-pastoris (L.) Medic.
Short's aster	Aster shortii Lindl.
Silver maple	Acer saccharinum L.
Skullcap	Scutellaria sp.
Smaller hop-clover	Trifolium procumbens L.
Small-flowered crowfoot	Ranunculus abortivus L.
Smooth crab grass	Digitaria ischaemum (Schreb.) (Schreb.) Muhl.
Smooth rock-cress	Arabis laevigata (Muhl.) Poir.
Smooth sumac	Rhus glabra L.
Sneezeweed	Helenium autumnale L.
Soft rush	Juncus effusus L.
Sour dock	Rumex crispus L.
Southern black haw	Viburnum rufidulum Raf.
Spanish-needles	Bidens bipinnata L.
Spice bush	Lindera benzoin (L.) Blume

APPENDIX J (Continued)

Common Name	Scientific Name
Spider-flower	*Cleome spinosa* L.
Spiderwort	*Tradescantia* sp.
Spike rush	*Eleocharis* sp.
Spike rush	*Elocharis* sp.
Spike rush	*Eleocharis* sp.
Spotted Joe-Pye weed	*Eupatorium purpureum* L.
Spotted touch-me-not	*Impatiens biflora* Walt.
Spring-beauty	*Claytonia virginica* L.
Squirrel-corn	*Dicentra canadensis* (Goldie) Walp.
Stickseed	*Hackelia virginiana* (L.) Johnst.
Sticktight	*Bidens vulgata* Greene
Stinging nettle	*Urtica chamaedryoides* Pursh.
Stinging nettle	*Urtica dioica* L.
Stinking love grass	*Eragrostis cilianensis* (All.) Link.
Sugar maple	*Acer saccharum* Marsh
Sweet-scented bedstraw	*Galium triflorum* Michx.
Sweet wormwood	*Artemisia annua* L.
Sycamore	*Platanus occidentalis* L.
Tall bellflower	*Campanula americana* L.
Tall goldenrod	*Solidago canadensis* L.
Teasel	*Dipsacus sylvestris* Huds.
Thimbleweed	*Anemone virginiana* L.
Thistle	*Cirsium discolor* (Muhl.) Spreng.
Thorny amaranth	*Amaranthus spinosus* L.
Three-seeded mercury	*Acalypha rhomboidea* Raf.
Thyme-leaved speedwell	*Veronica serpyllifolia* L.
Tick-trefoil	*Desmodium dillenii* Darl.
Tickseed-sunflower	*Bidens polylepis* Blake
Timothy	*Phleum pratense* L.
Tree of heaven	*Ailanthus altissima* (Mill.) Swingle
Trumpet-creeper	*Campsis radicans* (L.) Seem.
Upright primrose-willow	*Jussiaea decurrens* (Walt.) DC.
Venus' looking-glass	*Triodanis perfoliata* (L.) Nieuwl.
Vetch	*Vicia dasycarpa* Tem.
Viburnum	*Viburnum* sp.
Virginia bluebells	*Mertensia virginica* (L.) Pers.
Virginia-creeper	*Parthenocissus quinquefolia* (L.) Planch.
Virginia grape fern	*Botrychium virginianum* (L.) Sw.
Wartweed	*Euphorbia maculata* L.
Water hemp	*Amaranthus tuberculatus* (Moq.) Sauer
Water-purslane	*Ludwigia palustris* (L.) Ell.
Wheat	*Triticum aestivum* L.
White ash	*Fraxinus americana* L.
White avens	*Geum canadense* Jacq.
White basswood	*Tilia heterophylla* Vent.
White clover	*Trifolium repens* L.
White grass	*Leersia virginica* Willd.

APPENDIX J (Continued)

Common Name	Scientific Name
White heath aster	*Aster pilosus* Willd.
White oak	*Quercus alba* L.
White snakeroot	*Eupatorium rugosum* Houtt.
White sweet clover	*Melilotus alba* Desr.
White vervain	*Verbena urticifolia* L.
Wild bean	*Strophostyles helveola* (L.) Ell.
Wild carrot	*Daucus carota* L.
Wild ginger	*Asarum canadense* L.
Wild hyacinth	*Camassia scilloides* (Raf.) Cory
Wild lettuce	*Lactuca canadensis* L.
Wild onion	*Allium canadense* L.
Wild parsnip	*Pastinaca sativa* L.
Wild rye	*Elymus virginicus* L.
Wild sorrel	*Rumex hastatulus* Baldw.
Wild stonecrop	*Sedum ternatum* Michx.
Wild water pepper	*Polygonum hydropiperoides* Michx.
Willow	*Salix* sp.
Winter-cress	*Barbarea vulgaris* R. Br.
Wood-nettle	*Laportea canadensis* (L.) Wedd.
Wood-sage	*Teucrium canadense* L.
Yard grass	*Eleusine indica* (L.) Gaertn.
Yarrow	*Achillea millefolium* L.
Yellow buckeye	*Aesculus octandra* Marsh.
Yellow ironweed	*Verbesina alternifolia* (L.) Britt.
Yellow sweet clover	*Melilotus officinalis* (L.) Desr.
Yellow wood-sorrel	*Oxalis stricta* L.

Source: University of Louisville, 1976a and 1977

APPENDIX K

PLANTS FOUND DURING WILDFLOWER SURVEY TRIMBLE COUNTY GENERATING PLANT SITE

Common Name	Scientific Name
Bluegrass	*Poa pratensis* L.
Chaerophyllum	*Chaerophyllum procumbens* (L.) Crantz
Common blue violet	*Viola papilionacea* Pursh
Downy chess	*Bromus tectorum* L.
Dutchman's breeches	*Dicentra cucullaria* (L.) Bernh.
False rue anemone	*Isopyrum biternatum* (Raf.) T. & G.
Field pansy	*Viola rafinesquii* Greene
Fire-pink	*Silene virginica* L.
Geranium	*Geranium maculatum* L.
Golden Alexanders	*Zizia aptera* (Gray) Fern.
Great chickweed	*Stellaria pubera* Michx.
Jack in the pulpit	*Arisaema atrorubens* (Ait.) Blume
Large-flowered bellwort	*Uvularia grandiflora* Sm.
Miami mist	*Phacelia purshii* Buckl.
Smooth yellow violet	*Viola pensylvanica* Michx.
Spring cress	*Cardamine bulbosa* (Schreb.) BSP
Squirrel-corn	*Dicentra canadensis* (Goldie) Walp.
Swamp buttercup	*Ranunculus septentrionalis* Poir.
Twin-leaf	*Jeffersonia diphylla* (L.) Pers.
Wild yam	*Dioscorea quaternata* (Walt.) Gmel.
Yellow corydalis	*Corydalis flavula* (Raf.) DC.

Source: University of Louisville, 1976a

APPENDIX L

PLANT SPECIES FOUND IN RAVINES RA AND RB
TRIMBLE COUNTY GENERATING PLANT SITE

Common Name	Scientific Name	Location[a]
American elm	Ulmus americana L.	R
Appendaged waterleaf	Hydrophyllum appendiculatum Michx.	E,N,W
Avens	Geum vernum (Raf.) T. & G.	N
Beech	Fagus grandifolia Ehrh.	E,R
Big shellbark hickory	Carya laciniosa (Michx. f.) Loud.	N
Bindweed	Convolvulus sp.	N
Black cherry	Prunus serotina Ehrh.	N,R
Black locust	Robinia pseudoacacia L.	R
Black oak	Quercus velutina Lam.	E,N,R,W
Black walnut	Juglans nigra L.	E,N,R,W
Bladder-nut	Staphylea trifolia L.	N
Bloodroot	Sanguinaria canadensis L.	E,N,W
Blue ash	Fraxinus quadrangulata Michx.	R
Blue beech	Carpinus caroliniana Walt.	E,N,R,W
Bluegrass	Poa sp.	E,P,N
Blue phlox	Phlox divaricata L.	N
Boxelder	Acer negundo L.	E,N,R
Bramble	Rubus sp.	E,N,P,W
Butterweed	Senecio glabellus Poir.	P,R,W
Celandine poppy	Stylophorum diphyllum (Michx.) Nutt.	N
Chinquapin oak	Quercus prinoides Willd.	E,N,R,W
Cleavers	Galium aparine L.	E,N,R,W
Common blue violet	Viola papilionacea Pursh.	N
Common elder	Sambucus canadensis L.	N
Coralberry	Symphoricarpos orbiculatus Moench.	N,P,W
Cottonwood	Populus deltoides Marsh	R
Cut-leaved toothwort	Dentaria laciniata Muhl.	E,N,W
Dogwood	Cornus drummondii C.A. Meyer	E,N,R,W
Downy chess	Bromus tectorum L.	N
Dutchman's breeches	Dicentra cucullaria (L.) Desf.	N
False Solomon's seal	Smilacina racemosa (L.) Desf.	N,W
Fescue	Festuca sp.	N,P
Fire-pink	Silene virginica L.	N,W
Fleabane	Erigeron philadelphicus L.	P,R
Flowering dogwood	Cornus florida L.	E,W
Fragrant sumac	Rhus aromatica Ait.	E,W
Garlic-mustard	Alliaria officinalis Andrz.	E,N,R
Geranium	Geranium maculatum L.	W
Golden Alexanders	Zizia aptera (Gray) Fern.	N,W
Grape	Vitis sp.	W
Greek valerian	Polemonium reptans L.	E
Greenbrier	Smilax glauca Walt.	N
Green violet	Cubelium concolor (Forst.) Raf.	E
Hackberry	Celtis occidentalis L.	E,N,R
Hercules' club	Aralia spinosa L.	W
Honey-locust	Gleditsia triacanthos L.	N,R

APPENDIX L (Continued)

Common Name	Scientific Name	Location
Hop-hornbeam	*Ostrya virginiana* (Mill.) K. Koch	E,N,R
Jack in the pulpit	*Arisaema atrorubens* (Ait.) Blume	E,N,W
Japanese honeysuckle	*Lonicera japonica* Thunb.	E,N,W
Large-flowered bellwort	*Uvularia grandiflora* Sm.	N
Larkspur	*Delphinium tricorne* Michx.	E,N,W
Miami mist	*Phacelia purshii* Buckl.	N
Moonseed	*Menispermum canadense* L.	E,N,W
Mulberry	*Morus* sp.	N
Nodding thistle	*Carduus nutans* L.	P
Ohio buckeye	*Aesculus glabra* Willd.	E,N,R,W
Orchard grass	*Dactylis glomerata* L.	E,N,P,R,W
Osage-orange	*Maclura pomifera* (Raf.) Schneid.	R
Papaw	*Asimina triloba* (L.) Dunal.	R,W
Persimmon	*Diospyros virginiana* L.	W
Poison-ivy	*Rhus radicans* L.	E,N,R,W
Redbud	*Cercis canadensis* L.	E,N,R,W
	Chaerophyllum procumbens (L.) Crantz.	N
Red cedar	*Juniperus virginiana* L.	E,N,W
Red elm	*Ulmus rubra* Muhl.	E,N,R
Rose	*Rosa* sp.	E,P,W
Rue anemone	*Anemonella thalictroides* (L.) Spach.	W
Sassafras	*Sassafras albidum* (Nutt.) Nees.	N
Sedge	*Carex* sp.	N
Service-berry	*Amelanchier arborea* (Michx. f.) Fern.	N
Smooth rock-cress	*Arabis laevigata* (Muhl.) Poir.	N,W
Smooth yellow violet	*Viola pensylvanica* Michx.	N
Solomon's seal	*Polygonatum biflorum* (Walt.) Ell.	E,N
Southern black haw	*Viburnum rufidulum* Raf.	E,N,R
Spice bush	*Lindera benzoin* (L.) Blume	E,N,R,W
Star of Bethlehem	*Ornithogalum umbellatum* L.	N
Sugar maple	*Acer saccharum* Marsh	E,N,R,W
Sycamore	*Platanus occidentalis* L.	E,R,W
Touch-me-not	*Impatiens* sp.	E,N,R
Tulip tree	*Liriodendron tulipifera* L.	E,R,W
Twin-leaf	*Jeffersonia diphylla* (L.) Pers.	E,N,W
Virginia-creeper	*Parthenocissus quinquefolia* (L.) Planch.	E,N,W
Virginia grape fern	*Botrychium virginianum* (L.) Sw.	E,N,W
Wake-robin	*Trillium sessile* L.	E,N
White ash	*Fraxinum americana* L.	E,N,R,W
White basswood	*Tilia heterophylla* Vent.	E,N
Wild ginger	*Asarum canadense* L.	E,N,W
Wild stonecrop	*Sedum ternatum* Michx.	N,W
Wild strawberry	*Fragaria virginiana* Duchesne	N
Wild yam	*Dioscorea quaternata* (Walt.) Gmel.	W

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[a] E = east-facing slopes, Ravine RB
N = north-facing slopes, Ravine RA
P = pastureland
R = riparian communities
W = west-facing slopes, Ravine RB
Source: University of Louisville, 1977

APPENDIX M

BIRDS OBSERVED, TRIMBLE COUNTY GENERATING PLANT SITE, 1975

Common Name	Scientific Name	Month of Observation[a] March	April	May	June[a]
Great blue heron	*Ardea herodias*			X	
Green heron	*Butorides virescens*		X	X	X
Black-crowned night heron	*Nycticorax nycticorax*			X	
Canada goose	*Branta canadensis*		X		
Mallard	*Anas platyrhynchos*	X	X	X	
Black duck	*Anas rubripes*	X			
Gadwall	*Anas strepera*	X			
Pintail	*Anas acuta*	X			
American widgeon	*Mareca americana*	X			
Blue-winged teal	*Anas discors*	X			
Wood duck	*Aix sponsa*	X	X	X	X
Lesser scaup	*Aythya affinis*	X			
Turkey vulture	*Cathartes aura*	X	X	X	X
Cooper's hawk	*Accipiter cooperii*			X	
Red-tailed hawk	*Buteo jamaicensis*	X	X	X	
American kestrel	*Falco sparverius*	X	X	X	X
Bobwhite	*Colinus virginianus*		X	X	X
American coot	*Fulica americana*	X		X	
Killdeer	*Charadrius vociferus*	X	X	X	X
Herring gull	*Larus argentatus*			X	
Rock dove	*Columba livia*		X	X	X
Mourning dove	*Zenaida macroura*	X	X	X	X
Yellow-billed cuckoo	*Coccyzus americanus*			X	X
Black-billed cuckoo	*Coccyzus erythropthalmus*			X	
Screech owl	*Otus asio*		X	X	
Great horned owl	*Bubo virginianus*		X	X	
Chuck-will's-widow	*Caprimulgus carolinensis*		X	X	
Whip-poor-will	*Caprimulgus vociferus*		X	X	X
Common nighthawk	*Chordeiles minor*			X	
Chimney swift	*Chaetura pelagica*		X	X	X
Ruby-throated hummingbird	*Archilochus colubris*				X
Belted kingfisher	*Megaceryle alcyon*	X	X	X	X

APPENDIX M (Continued)

Common Name	Scientific Name	Month of Observation March	April	May	June[a]
Common flicker	*Colaptes auratus*	X	X	X	X
Pileated woodpecker	*Dryocopus pileatus*		X	X	
Red-bellied woodpecker	*Centurus carolinus*		X	X	X
Red-headed woodpecker	*Melanerpes erythrocephalus*		X	X	X
Yellow-bellied sapsucker	*Sphyrapicus varius*		X	X	
Hairy woodpecker	*Dendrocopos villosus*		X	X	
Downy woodpecker	*Dendrocopos pubescens*	X	X	X	X
Eastern kingbird	*Tyrannus tyrannus*		X	X	X
Great crested flycatcher	*Myiarchus crinitus*			X	X
Eastern phoebe	*Sayornis phoebe*	X	X	X	X
Acadian flycatcher	*Empidonax virescens*				X
Eastern wood pewee	*Contopus virens*		X	X	X
Horned lark	*Eremophila alpestris*				X
Olive-sided flycatcher	*Nuttallornis borealis*			X	
Bank swallow	*Riparia riparia*			X	X
Rough-winged swallow	*Stelgidopteryx ruficollis*			X	X
Barn swallow	*Hirundo rustica*		X	X	X
Cliff swallow	*Petrochelidon pyrrhonota*			X	
Purple martin	*Progne subis*		X	X	X
Blue jay	*Cyanocitta cristata*	X	X	X	X
Common crow	*Corvus brachyrhynchos*	X	X	X	X
Carolina chickadee	*Parus carolinensis*	X	X	X	X
Tufted titmouse	*Parus bicolor*	X	X	X	X
White-breasted nuthatch	*Sitta carolinensis*	X	X		X
Brown creeper	*Certhia familiaris*		X		
House wren	*Troglodytes aedon*		X	X	X
Bewick's wren	*Thryomanes bewickii*			X	
Carolina wren	*Thryothorus ludovicianus*	X	X		X
Mockingbird	*Mimus polyglottos*	X	X	X	X
Catbird	*Dumetella carolinensis*		X	X	X
Brown thrasher	*Toxostoma rufum*	X	X	X	X

APPENDIX M (Continued)

Common Name	Scientific Name	Month of Observation[a] March	 April	 May	 June
American robin	Turdus migratorius	X	X	X	X
Wood thrush	Hylocichla mustelina		X	X	X
Hermit thrush	Catharus guttatus		X	X	
Swainson's thrush	Catharus ustulatus			X	
Gray-cheeked thrush	Catharus minimus			X	
Veery	Catharus fuscescens			X	
Eastern bluebird	Sialia sialis	X	X	X	X
Blue-gray gnatcatcher	Polioptila caerulea			X	X
Cedar waxwing	Bombycilla cedrorum		X	X	X
Loggerhead shrike	Lanius ludovicianus				X
Starling	Sturnus vulgaris	X	X	X	X
White-eyed vireo	Vireo griseus		X	X	X
Yellow-throated vireo	Vireo flavifrons				X
Red-eyed vireo	Vireo olivaceus			X	X
Warbling vireo	Vireo gilvus			X	X
Black-and-white warbler	Mniotilta varia		X	X	
Prothonotary warbler	Protonotaria citrea			X	
Worm-eating warbler	Helmitheros vermivorus		X	X	
Blue-winged warbler	Vermivora pinus			X	X
Yellow warbler	Dendroica petechia		X	X	X
Magnolia warbler	Dendroica magnolia			X	
Yellow-rumped warbler	Dendroica coronata		X	X	
Cerulean warbler	Dendroica cerulea			X	X
Yellow-throated warbler	Dendroica dominica				X
Blackpoll warbler	Dendroica striata		X	X	
Pine warbler	Dendroica pinus			X	
Prairie warbler	Dendroica discolor			X	X
Palm warbler	Dendroica palmarum		X	X	
Ovenbird	Seiurus aurocapillus				X
Louisiana waterthrush	Seiurus motacilla				X
Kentucky warbler	Oporornis formosus		X	X	X
Mourning warbler	Oporornis philadelphia			X	

APPENDIX M (Continued)

Common Name	Scientific Name	Month of Observation March	 April	 May	 June[a]
Yellowthroat	*Geothlypis trichas*			X	X
Yellow-breasted chat	*Icteria virens*			X	X
Hooded warbler	*Wilsonia citrina*				X
Wilson's warbler	*Wilsonia pusilla*			X	
Canada warbler	*Wilsonia canadensis*		X	X	
American redstart	*Setophaga ruticilla*		X	X	
House sparrow	*Passer domesticus*	X	X	X	X
Eastern meadowlark	*Sturnella magna*	X	X	X	X
Red-winged blackbird	*Agelaius phoeniceus*	X	X	X	X
Orchard oriole	*Icterus spurius*		X	X	X
Northern oriole	*Icterus galbula*		X	X	
Common grackle	*Quiscalus quiscula*	X	X	X	X
Brown-headed cowbird	*Molothrus ater*	X	X	X	X
Scarlet tanager	*Piranga olivacea*			X	X
Summer tanager	*Piranga rubra*			X	X
Cardinal	*Cardinalis cardinalis*	X	X	X	X
Rose-breasted grosbeak	*Pheucticus ludovicianus*			X	
Indigo bunting	*Passerina cyanea*		X	X	X
Dickcissel	*Spiza americana*			X	
Pine siskin	*Spinus pinus*	X			
American goldfinch	*Spinus tristis*	X	X	X	X
Rufous-sided towhee	*Pipilo erythrophthalmus*	X	X	X	X
Savannah sparrow	*Passerculus sandwichensis*			X	
Grasshopper sparrow	*Ammodramus savannarum*				X
Vesper sparrow	*Pooecetes gramineus*			X	
Dark-eyed junco	*Junco hyemalis*	X	X	X	
Tree sparrow	*Spizella arborea*		X		
Chipping sparrow	*Spizella passerina*		X	X	X
Field sparrow	*Spizella pusilla*		X	X	X

Common Name	Scientific Name	Month of Observation[a]			
		March	April	May	June
White-crowned sparrow	*Zonotrichia leucophrys*			X	
White-throated sparrow	*Zonotrichia albicollis*	X	X	X	
Fox sparrow	*Passerella iliaca*		X		
Song sparrow	*Melospiza melodia*	X	X	X	X

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[a] Breeding birds only.

Source: University of Louisville, 1975a

APPENDIX N

SUMMER BREEDING BIRD SURVEY

APPENDIX N

TOTAL INDIVIDUALS RECORDED ON SUMMER BREEDING BIRD SURVEY COUNTS FOR THE BEDFORD ROUTE (21 JUNE 1975) AND THE GOSHEN ROUTE (22 JUNE 1975), COMPARED TO THE 1974 MEAN NUMBER OF INDIVIDUALS PER KENTUCKY COUNT TAKEN (29 COUNTS INCLUDED)

Species	Bedford 1975	Goshen 1975	Ky-Mean 1974
Bobwhite	38	48	38.9
Mourning dove	62	52	43.5
Yellow-billed cuckoo	24	3	12.3
Chimney swift	26	25	24.4
Common flicker	28	14	5.7
Red-bellied woodpecker	18	9	6.3
Eastern kingbird	15	11	5.5
Eastern phoebe	11	1	3.8
Eastern wood pewee	6	6	7.2
Barn swallow	42	48	39.7
Blue jay	42	26	15.7
Common crow	47	36	34.8
Carolina chickadee	9	4	4.8
Tufted titmouse	23	12	10.5
Carolina wren	40	13	14.9
Mockingbird	15	17	18.8
Robin	57	101	42.2
Wood thrush	16	9	7.4
Eastern bluebird	13	8	12.3
Starling	76	227	133.9
Yellow-throated vireo	5	1	0.4
Red-eyed vireo	13	6	3.9
Warbling vireo	8	3	0.6
Prairie warbler	9	1	3.0
Yellowthroat	21	20	19.3
Yellow-breasted chat	21	5	16.5
House sparrow	61	101	54.1
Eastern meadowlark	33	93	65.2
Red-winged blackbird	85	179	83.8

APPENDIX N (Continued)

Species	Bedford 1975	Goshen 1975	Ky-Mean 1974
Orchard oriole	16	12	6.6
Common grackle	150	343	164.9
Brown-headed cowbird	28	16	14.7
Cardinal	34	33	40.4
Indigo bunting	120	53	60.5
American goldfinch	39	15	10.5
Rufous-sided towhee	19	14	13.3
Chipping sparrow	23	3	8.4
Field sparrow	40	31	29.1
Song sparrow	37	41	17.1

Source: University of Louisville, 1975a

APPENDIX O

WATER QUALITY TABLES

APPENDIX O

Table 1

PHYSICOCHEMICAL PARAMETERS OF WATERS FROM THE OHIO RIVER TRIMBLE COUNTY GENERATING PLANT SITE, MAY 28-29, 1975[a]

Date	Ohio River Mile	Station	Where Sampled	Carbonate hardness	Noncarbonate hardness	Bicarbonate alkalinity	Carbonate alkalinity	Temperature C°	pH	Turbidity NTU	Dissolved oxygen	Conductivity (μmho/cm^2)	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total residue	Suspended solids	COD
28-29 May	570	01	Ind	104	56	48	0	23	7.6	18.0	7.9	280	27.2	8.8	11.3	1.6	0	0	74.5	17.5	1.50	0.005	0.09	174	56	637
		02	Mid	98	-	-	0	23	-	21.0	7.6	-	25.0	8.7	8.6	1.6	0.1	0	-	13.9	0.92	0.005	0.31	280	10	-
		03	Ky	147	-	-	0	23	-	30.0	7.4	-	44.0	9.0	10.8	1.7	0	0	-	13.9	0.40	0.006	0.31	270	57	-
	571	04	Ind	103	84	19	0	23	7.7	65.0	7.8	280	27.5	8.3	9.9	1.7	0	0	119.0	12.9	5.30	0.006	0.47	236	31	554
		05	Mid	101	55	46	0	23	7.6	22.0	7.8	280	26.5	8.6	11.4	1.6	0.1	0	88.7	13.5	6.70	0.005	0.18	164	21	660
		06	Ky	100	58	42	0	23	7.6	60.0	7.7	270	26.2	8.4	9.9	1.6	0	0	75.2	13.9	0.49	0.006	0.18	200	12	641
	572	07	Ind	105	53	52	0	23	7.8	18.0	6.6	322	27.0	9.1	12.2	1.8	0	0	78.6	15.5	0.32	0.006	0.31	192	15	471
		08	Mid	101	49	52	0	23	7.7	19.0	7.0	310	25.2	9.0	12.1	1.8	0	0	81.9	15.9	0.37	0.003	0.18	180	15	616
		09	Ky	99	59	40	0	23	7.6	42.0	6.8	280	25.5	8.7	10.7	0	0	0	56.6	14.5	0.35	0.005	0.31	186	38	442

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

APPENDIX O

Table 2

PHYSICOCHEMICAL PARAMETERS FOR OHIO RIVER AT THE TRIMBLE COUNTY GENERATING PLANT SITE, JULY 1975[a,b]

	Station	Carbonate hardness	Noncarbonate hardness	Bicarbonate alkalinity	Carbonate alkalinity	Temperature °C	pH	Turbidity NTU	Dissolved oxygen	Conductivity (μmho/cm²)	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total residue	Suspended solids	COD	NH_4
Ohio River	1	131	-	80	0	28.3	7.6	9.0	5.7	380	33.7	11.5	18.0	2.9	0.30	0	87.0	27.9	1.43	0.061	0.69	226	7	18.6	0
	2	125	-	76	0	28.4	7.6	12.0	5.8	360	31.0	11.5	17.8	2.9	0.30	0	95.5	24.9	1.76	0.070	0.73	224	12	14.8	0
	3	135	-	78	0	28.3	7.8	10.0	5.3	275	34.5	11.8	18.2	2.8	0.26	0	92.1	23.3	1.98	0.064	0.77	226	5	37.2	0
	4	133	-	76	0	28.2	7.6	6.0	5.3	340	33.7	12.0	18.3	2.8	0.36	0	92.1	23.5	1.54	0.061	0.48	222	8	0	0
	5	130	-	79	0	28.6	7.6	6.0	5.8	360	32.0	12.3	18.0	2.8	0.34	0	78.6	25.5	1.47	0.070	0.66	234	22	26.0	0
	6	130	-	76	0	28.5	7.8	9.0	5.6	360	31.5	12.4	18.3	2.8	0.46	0	95.5	39.0	1.65	0.056	0.66	222	14	11.2	0
	7	129	-	80	0	28.0	7.6	7.0	5.2	360	31.2	12.5	18.8	2.8	0.20	0	87.0	33.4	0.81	0.053	0.67	240	10	11.2	0
	8	139	-	78	0	28.2	7.6	7.0	5.9	360	35.5	12.3	18.4	2.8	0.36	0	90.4	26.5	1.03	0.092	0.77	220	8	40.8	0
	9	135	-	76	0	28.2	7.6	8.0	5.2	380	34.0	12.3	18.0	2.8	0.40	0	109.1	27.9	1.47	0.061	0.67	212	6	11.1	0

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[a] Ohio River samples on July 10, except for temperature and O_2 which were measured July 29.

[b] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

APPENDIX O

Table 3

PHYSICOCHEMICAL PARAMETERS FOR OHIO RIVER AT THE TRIMBLE COUNTY GENERATING PLANT SITE, AUGUST 1975[a]

	Date	Station	Carbonate hardness	Noncarbonate hardness	Bicarbonate alkalinity	Carbonate alkalinity	Temperature °C	pH	Turbidity NTU	Dissolved oxygen	Conductivity (µmho/cm^2)	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total residue	Suspended solids	COD	NH_4
Ohio River	28 Aug 1975	1	150	84	66	0	26.5	7.8	2.5	5.5	580	--	--	-	-	--	-	--	-	0.40	--	0.74	-	--	-	-
		2	152	86	66	0	26.5	7.8	2.4	6.2	460	--	--	-	-	--	-	--	-	0.51	--	0.72	-	--	-	-
		3	150	84	66	0	26.0	7.8	2.2	6.4	460	--	--	-	-	--	-	--	-	0.37	--	0.72	-	--	-	-
		4	153	93	60	0	26.0	7.8	2.6	5.6	560	--	--	-	-	--	-	--	-	0.42	--	0.85	-	--	-	-
		5	155	85	70	0	26.5	7.7	2.3	5.6	560	--	--	-	-	--	-	--	-	0.37	--	0.89	-	--	-	-
		6	151	81	70	0	26.0	7.8	2.1	5.9	470	--	--	-	-	--	-	--	-	0.35	--	0.67	-	--	-	-
		7	156	94	62	0	26.4	7.8	3.2	5.9	480	--	--	-	-	--	-	--	-	0.44	--	0.76	-	--	-	-
		8	154	86	68	0	26.4	7.8	2.3	5.8	450	--	--	-	-	--	-	--	-	0.42	--	0.84	-	--	-	-
		9	156	96	60	0	26.0	7.8	2.9	5.6	450	--	--	-	-	--	-	--	-	0.29	--	0.93	-	--	-	-

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

APPENDIX O

Table 4

PHYSICOCHEMICAL PARAMETERS FOR OHIO RIVER AT THE TRIMBLE COUNTY GENERATING PLANT SITE, SEPTEMBER 1975[a]

	Date	Station	Discharge m^3/sec	Carbonate hardness	Noncarbonate hardness	Bicarbonate alkalinity	Carbonate alkalinity	Temperature C	pH	Turbidity NTU	Dissolved oxygen	Conductivity (µmho/cm²)	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total residue	Suspended solids	COD	BOD_5	Fecal coliforms organisms/100 ml	NH_4
Ohio River	11 Sept 75	1	---	174	112	62	0	26	7.6	3.2	6.3	650	46.3	13.7	29.2	4.5	0.10	0.0	90.0	38.5	1.94	0.037	0.28	322	10	-----	4.2	300	0
		2	---	184	124	60	0	26	7.6	3.2	6.5	540	50.3	13.9	29.2	4.4	0.20	0.0	90.0	39.9	0.44	0.020	0.49	326	8	141.9	4.7	900	0
		3	---	178	118	60	0	26	7.7	2.6	6.5	500	48.0	13.8	28.3	4.6	0.10	0.0	85.0	37.0	0.49	0.014	0.51	322	8	5.1	4.6	800	0
		4	---	180	120	60	0	26	7.7	5.3	6.4	520	48.0	14.1	28.3	4.4	0.20	0.0	80.0	35.5	0.42	0.030	0.49	306	9	18.0	2.7	300	0
		5	---	180	119	61	0	26	7.7	5.0	6.3	510	48.3	14.1	28.7	4.4	0.24	0.0	85.0	39.2	0.53	0.020	0.36	322	9	15.7	2.9	1,100	0
		6	---	174	108	66	0	26	7.9	8.2	6.4	520	46.7	13.6	28.1	4.4	0.16	0.0	88.5	37.0	0.40	0.020	0.45	330	14	23.1	3.1	200	0
		7	---	189	127	62	0	26	7.7	4.7	6.5	500	52.3	13.9	29.0	4.4	0.26	0.0	88.5	40.0	0.31	0.010	0.27	330	13	27.4	4.2	------	0
		8	---	191	129	62	0	26	7.7	3.6	6.4	510	52.0	14.4	29.3	4.5	0.16	0.0	90.0	40.0	0.42	0.013	0.36	320	10	14.9	4.2	300	0
		9	---	190	130	60	0	26	7.7	3.0	6.5	520	52.0	14.1	28.2	4.4	0.16	0.0	1050	36.2	0.33	0.013	0.31	304	7	2.3	4.4	100	0

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

APPENDIX O

Table 5

PHYSICOCHEMICAL PARAMETERS FOR OHIO RIVER AT THE TRIMBLE COUNTY GENERATING PLANT SITE, OCTOBER 1975[a]

	Date	Station	Carbonate Hardness	Noncarbonate Hardness	Bicarbonate Hardness	Carbonate Alkalinity	Temperature °C	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended Solids	COD	NH_4
Ohio River	22 Oct 1975	1	130	70	60	0	17	7.2	90	8.2	310	37.2	9.0	13.8	4.8	2.2	0	70.8	18.9	0.18	0.037	0.56	372	93	21.6	0
		2	127	67	60	0	17	7.4	80	8.0	330	34.7	9.8	15.6	3.8	2.0	0	85.9	22.9	1.39	0.033	0.49	360	72	22.6	0
		3	131	71	60	0	17	7.3	85	8.0	350	35.0	10.6	16.6	4.3	1.0	0	92.7	21.9	1.28	0.031	0.57	388	74	22.6	0
		4	128	62	66	0	17	7.2	88	8.0	310	36.0	9.4	14.3	4.2	1.4	0	80.9	16.9	1.37	0.031	0.61	344	78	22.6	0
		5	128	66	62	0	17	7.2	87	7.6	340	34.7	10.0	15.6	3.9	1.4	0	80.9	17.9	1.47	0.031	0.57	372	78	17.0	0
		6	140	80	60	0	17	7.3	88	7.0	350	36.2	12.0	17.1	4.6	1.2	0	94.4	17.9	1.32	0.037	0.37	382	80	18.0	0
		7	127	61	66	0	17	7.2	95	8.0	320	35.0	9.6	16.0	3.8	1.1	0	52.3	16.9	1.47	0.033	0.49	374	94	68.0	0
		8	128	60	68	0	17	7.2	90	7.2	340	34.0	10.5	18.0	4.0	1.2	0	75.9	22.9	1.19	0.031	0.48	396	94	22.0	0
		9	130	68	62	0	17	7.2	85	7.8	350	34.5	10.6	18.1	4.4	1.6	0	64.1	21.9	1.61	0.031	0.34	354	72	29.0	0

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

APPENDIX O

Table 6

HEAVY METALS ANALYSIS OF SEDIMENT SAMPLE FROM OHIO RIVER, MILE 571, OCTOBER 9, 1975[a]

	Na	K	Ca	Mg	Fe	Mn	Cu	Cr	Pb	Zn
Kentucky	5.7	6.1	5.2	2.5	7.2	0.49	0.013	0.026	0.0	0.09
Mid-channel	12.2	8.1	12.6	2.8	6.3	1.7	0.023	1.0	0.0	0.01
Indiana	10.6	19.4	8.6	7.6	22.1	1.8	0.030	0.14	0.0	0.32

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[a] All values in mg/gram of dry sediment.

Source: University of Louisville, 1975b

Table 7

PHYSICOCHEMICAL PARAMETERS FOR OHIO RIVER AT THE TRIMBLE COUNTY GENERATING PLANT SITE, NOVEMBER 1975[a]

	Date	Station	Carbonate Hardness	Noncarbonate Hardness	Bicarbonate Hardness	Carbonate Alkalinity	Temperature °C	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended Solids	COD	NH_4
Ohio River	27 Nov '75 572 571 570	1	111	51	60	0	10	7.3	35.0	11.0	320	28.8	9.4	15.6	3.0	0.24	0	70.7	13.0	1.06	0.006	0.14	206	21	68	0
		2	108	52	56	0	10	7.3	30.0	11.4	325	28.0	9.3	15.0	3.0	0.38	0	131.5	11.0	1.21	0.003	0.18	198	36	23	0
		3	109	47	62	0	10	7.3	38.0	10.6	280	28.8	9.0	14.4	3.0	0.72	0	114.5	13.0	1.25	0.003	0.15	240	19	91	0
		4	110	48	62	0	10	7.3	40.0	10.2	330	28.2	9.6	15.9	2.8	0.38	0	70.7	14.0	1.39	0.006	0.21	220	10	25	0
		5	104	42	62	0	9	7.2	42.0	10.4	320	26.8	9.1	14.7	3.0	1.04	0	44.0	8.5	1.25	0.005	0.22	224	16	32	0
		6	103	47	56	0	9	7.2	35.0	10.8	320	26.5	8.9	14.2	3.0	0.66	0	81.0	8.5	0.88	0.006	0.18	198	20	38	0
		7	107	51	56	0	10	7.3	40.0	9.4	310	27.0	9.8	15.8	2.9	0.74	0	97.7	8.0	1.25	0.003	0.13	206	24	45	0
		8	106	44	62	0	9	7.3	35.0	10.8	280	26.5	9.7	15.4	3.2	0.46	0	111.2	10.5	2.02	0.006	0.15	216	20	87	0
		9	104	44	60	0	9	7.3	38.0	11.0	290	26.5	9.2	14.4	3.1	1.16	0	114.5	10.0	1.25	0.003	0.16	194	21	21	0

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975b

APPENDIX O

Table 8

PHYSICOCHEMICAL PARAMETERS FOR OHIO RIVER AT THE TRIMBLE COUNTY GENERATING PLANT SITE, DECEMBER 1975[a]

Date	Station	Carbonate Hardness	Noncarbonate Hardness	Bicarbonate Alkalinity	Carbonate Alkalinity	Temperature C°	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended Solids	COD	NH_4
15 Dec.'75	(570) Ind 1	129	51	78	0	8.0	7.3	10	11.6	360	34.7	10.4	17.2	2.4	0.24	0	74.2	21.5	1.91	0.02	0.51	246	10	16.9	0
	Mid 2	130	64	66	0	8.0	7.35	12	11.4	360	33.8	11.2	20.7	2.5	0.66	0	80.9	24.9	1.80	0.013	0.52	268	12	18.8	0
	Ky 3	131	53	78	0	8.0	7.4	15	11.4	360	33.8	11.4	20.4	2.4	0.24	0	87.6	11.9	1.54	0.013	0.51	256	4	27.9	0
	(571) Ind 4	131	53	78	0	8.0	7.3	10	11.4	365	35.0	10.5	17.6	2.3	0.40	0	72.5	13.9	1.32	0.02	0.37	252	6	32.4	0
	Mid 5	128	48	80	0	8.0	7.3	13	11.4	365	32.8	11.3	20.4	2.4	0.44	0	74.2	13.5	1.36	0.011	0.39	264	8	38.6	0
	Ky 6	131	65	66	0	8.0	7.3	14	11.8	360	33.5	11.5	20.7	3.0	0.46	0	80.9	21.5	1.98	0.011	0.42	246	2	20.4	0
	(572) Ind 7	128	40	88	0	8.0	7.3	15	11.6	370	33.8	10.6	17.6	2.4	0.48	0	70.8	15.5	2.27	0.02	0.50	234	2	20.9	0
	Mid 8	133	71	62	0	8.0	7.3	10	11.8	360	34.5	11.3	20.4	2.6	0.50	0	74.2	13.5	1.81	0.013	0.51	234	2	29.8	0
	Ky 9	133	55	78	0	8.0	7.3	15	11.6	370	34.0	11.6	20.9	2.4	0.60	0	77.5	22.5	1.54	0.013	0.52	260	4	25.6	0

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975b

APPENDIX O

Table 9

PHYSICOCHEMICAL PARAMETERS OF CORN CREEK, BAREBONE CREEK, AND THE OXBOW WATERS, APRIL 1975

Date	Station	Discharge, m^3/s	CO_3 Hardness, ppm	non CO_3 Hardness, ppm	HCO_3 Alkalinity, ppm	CO_3 Alkalinity, ppm	Temp. °C	pH	Turbidity, NTU	DO, ppm	Conductivity, µmho	Ca, ppm	Mg, ppm	Na, ppm	K, ppm	Fe, ppm	Mn, ppm	SO_4, ppm	Cl, ppm	PO_4, ppm	NO_2, ppm	NO_3, ppm	Total Residucs, mg/l	Suspended solids, mg/l	
9 April 1975	1	0.31	229	47	182	20	9	8.7	2.5	12.2	450	53.5	23.1	3.1	1.5	0	0.05	17.0	10.66	0.86	.005	1.1	242	1	
	2	0.56	254	62	192	20	8	8.6	3.5	11.7	495	62.2	24.0	3.1	1.5	0	0.05	22.0	9.64	0.009	.003	1.35	278	1	
	3	0.59	258	34	224	0	8	8.4	5.0	10.4	495	63.7	24.1	3.1	1.5	0	0.1	23.7	5.58	0.55	.006	0.63	278	2	
	4		286	36	250	0	9	8.2	15.0	8.2	570	73.7	24.7	3.6	1.4	0	0.2	28.7	8.63	0.29	.006	1.35	336	29	Backwater
	5	0.21	259	23	236	12	6	8.5	3.0	11.4	570	63.0	24.8	3.4	1.4	0	0.1	32.0	7.61	0.35	.005	0.65	318	5	
	6		276	50	226	20	8	8.5	5.0	10.8	530	71.5	23.8	3.4	1.6	0	0.1	25.5	9.14	0.35	.006	0.45	318	5	
22 April 1975	1	0.2	250	56	194	20	12	8.6	2.6	12.2	485	57.3	26.1	3.1	1.5	.08	0	42.0	4.1	1.8	.003	0.3	278	1	
	2	0.59	268	48	220	4	11	8.7	1.9	11.6	520	64.0	26.4	3.1	1.5	.08	0	45.6	5.9	0.26	.003	0.65	296	3	
	3		267	59	208	20	12	8.7	3.6	11.6	520	64.0	26.2	3.1	1.5	.08	0.05	40.5	5.6	0.18	.003	0.87	310	1	
	4		272	44	228	0	13	8.2	6.8	9.2	525	66.0	26.0	3.4	1.7	.01	0.05	47.3	5.6	0.13	.003	0.87	310	11	Backwater
	5	0.22	292	46	246	0	12	8.6	2.0	10.4	600	74.0	26.0	3.4	1.5	.04	0.05	65.7	6.8	0.18	.003	0.65	316	2	
	6		275	47	228	24	13	8.7	3.4	10.5	570	67.6	25.8	3.5	1.0	0	0.05	55.6	4.6	0.07	.006	0.65	318	2	
	7				224	16	24	8.2	12.0	9.8	415	71.3	21.0	5.1	2.7	.20	2.20	47.2	7.8	0.64	.005	0.65	326	14	Isolated

Source: University of Louisville, 1975a

APPENDIX O

Table 10

PHYSICOCHEMICAL PARAMETERS OF WATERS FROM VARIOUS STATIONS AT THE TRIMBLE COUNTY GENERATING PLANT SITE, MAY 8 AND 22, 1975[a]

Date	Station	Discharge (m^3/s)	Carbonate hardness	Noncarbonate hardness	Bicarbonate alkalinity	Carbonate alkalinity	Temperature C	pH	Turbidity NTU	Dissolved oxygen	Conductivity (μmho/cm^2)	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total residue	Suspended solids	COD
8 May	1	0.41	221	1	180	20	15	8.6	1.8	10.6	460	51.2	22.7	3.2	0.9	0.1	0	45.2	7.4	0.35	0.003	0.87	252	3	-
	2	0.70	237	27	182	28	15	8.6	2.3	10.0	500	56.5	23.4	3.1	1.5	0.1	0	47.2	7.6	1.21	0.005	0.65	272	5	-
	3	-	232	32	200	10	16	8.6	4.3	8.0	480	55.7	22.6	3.0	1.7	0.1	0	43.1	5.1	0.59	0.005	0.65	266	6	-
	4	-	221	25	180	16	17	9.0	9.0	8.0	500	52.5	21.9	3.0	1.8	0.2	0	45.8	11.2	0.68	0.006	0.87	260	6	-
	5	0.54	175	-87	242	20	14	8.6	2.6	10.2	560	69.0	25.8	2.9	1.7	0	0	73.5	4.6	0.42	0.007	0.65	326	-	
	6	-	261	11	226	24	15	8.5	5.0	8.4	540	67.5	22.6	2.7	1.6	0	0	53.9	5.6	0.44	0.003	0.65	300	7	-
22 May	1	0.10	239	19	220	20	21	8.1	2.3	7.0	500	57.0	23.6	3.3	1.8	0	0	43.8	12.5	0.60	0.005	0.18	266	3	280
	2	0.12	262	28	218	16	21	8.3	3.3	7.0	540	65.7	24.0	3.1	2.0	0	0	49.2	7.9	0.66	0.006	0.64	273	4	23
	3	-	270	24	202	44	21	8.4	3.3	7.1	560	68.5	24.0	3.1	2.0	0	0	49.8	8.5	0.77	0.003	0.64	300	58	-
	4	-	274	22	240	12	21	8.3	6.2	4.8	560	69.5	24.4	3.2	2.4	0	0	45.8	12.2	0.13	0.006	0.87	290	6	-
	5	0.07	282	32	250	0	23	8.2	5.4	6.3	575	74.2	23.6	3.2	2.0	0.2	0	66.0	9.7	0.73	0.005	1.95	312	3	-
	6	-	270	16	242	12	24	8.1	17.0	6.0	550	68.5	24.2	3.3	2.1	0.1	0	63.3	6.9	1.25	0.003	1.40	320	41	-

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

APPENDIX O

Table 11

PHYSICOCHEMICAL PARAMETERS OF CORN CREEK AND BAREBONE CREEK WATERS, JUNE 1975[a]

Date	Station	Carbonate hardness	Noncarbonate hardness	Bicarbonate alkalinity	Carbonate alkalinity	Temperature C	pH	Turbidity NTU	Dissolved oxygen	Conductivity (µmho/cm^2)	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total residue	Suspended solids	COD	NH_4
3 June	1	229	29	176	24	19	7.9	1.5	7.9	440	54.0	22.9	3.4	1.5	0	0	26.3	7.7	6.7	0.003	0.10	248	21	-	0
	2	258	38	204	16	17	7.9	5.2	8.6	480	64.7	23.5	3.2	1.7	0	0	35.1	14.2	0.88	0.003	0.47	254	10	-	0
	3	258	20	208	20	18	7.7	4.8	6.7	500	64.2	23.9	3.1	1.8	0	0	33.0	9.5	0.48	0.003	0.18	240	8	-	0
	4	241	25	204	12	17	7.8	7.2	6.0	500	58.0	23.5	3.1	1.7	0	0	34.4	6.9	0.57	0.003	0.47	244	11	-	0
	5	278	48	210	20	18	7.9	6.0	7.7	580	73.2	23.2	3.5	1.6	0	0	45.8	8.9	0.51	0.003	0.31	290	8	-	0
	6	255	41	190	24	18	7.8	7.0	7.5	510	66.5	21.6	3.4	1.7	0	0	39.1	8.5	1.7	0.005	0.31	248	4	-	0
18 June	1	219	21	198	0	21	8.0	9.5	7.6	420	51.2	22.2	3.9	2.0	0	0	29.7	9.2	0.62	0.005	0.86	254	16	-	0
	2	239	15	224	0	20	7.8	7.2	7.9	470	56.2	22.8	3.4	1.8	0	0	31.7	5.9	1.03	0.005	0.65	274	11	-	0
	3	250	24	226	0	21	7.6	12.0	5.2	500	62.5	22.8	3.3	1.9	0	0	34.4	7.9	3.8	0.003	0.86	300	19	-	0
	4	254	16	238	0	21	7.5	14.0	3.9	540	62.7	23.8	3.4	2.2	0	0	35.1	6.5	0.77	0.001	1.10	302	18	-	0
	5	243	21	222	0	21	7.8	16.0	7.1	520	62.5	21.2	3.6	2.1	0.05	0	41.1	9.5	0.88	0.005	3.40	312	29	-	0
	6	257	33	224	0	22	8.0	7.0	6.8	500	66.5	22.2	3.5	1.9	0	0	39.1	7.2	0.99	0.005	0.86	290	17	-	0

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

APPENDIX O

Table 12

PHYSICOCHEMICAL PARAMETERS FOR CORN CREEK AND BAREBONE CREEK WATER, JULY 1975[a]

Stream	Date	Station	Carbonate Hardness	Noncarbonate Hardness	Bicarbonate Alkalinity	Carbonate Alkalinity	Temperature °C	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho/cm2	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended Solids	COD	NH_4
Corn and Barebone Creeks	2 July 1975	1	220	18	190	12	25.0	7.8	2.0	7.5	460	52.0	22.0	3.8	2.5	0	0	33.0	10.4	0.57	0.003	0.18	290	3	--	0
		2	269	32	224	12	22.0	7.7	5.2	6.4	540	68.7	23.8	3.3	2.5	0	0	43.8	8.5	0.49	0.005	0.30	306	5	--	0
		3	276	18	246	12	22.0	7.4	3.2	2.6	540	71.5	23.8	3.3	2.5	0	0	35.1	7.9	1.03	0.003	0.32	298	5	--	0
		4	269	11	246	12	22.0	7.7	5.3	4.5	560	69.2	23.4	3.3	2.6	0	0	37.1	6.9	1.91	0.006	0.32	312	5	--	0
		5	279	29	238	12	22.0	7.9	4.5	4.6	580	74.0	23.0	3.3	2.9	0	0	47.2	9.5	1.72	0.001	0.32	320	6	--	0
		6					----------	----------	D R Y	----------	----------															
	22 July 1975	1	209	9	188	12	26.0	8.0	2.5	8.2	480	48.5	21.3	-	-	-	-	-	-	1.32	-	0.36	-	-	-	-
		2	279	3	264	12	23.0	7.9	6.0	6.5	590	70.7	25.0	-	-	-	-	-	-	1.43	-	0.42	-	-	-	-
		3	283	-5	276	12	22.0	7.4	3.5	2.0	550	72.2	25.0	-	-	-	-	-	-	1.36	-	0.32	-	-	-	-
		4	278	-4	270	12	22.0	7.8	5.4	4.3	570	70.0	25.1	-	-	-	-	-	-	0.79	-	0.30	-	-	-	-
		5	225	49	160	16	26.0	8.3	10.0	6.8	460	58.0	19.5	-	-	-	-	-	-	0.81	-	0.60	-	-	-	-
		6	185	-37	202	20	26.0	8.0	25.0	6.8	510	46.0	17.1	-	-	-	-	-	-	1.06	-	0.78	-	-	-	-

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

APPENDIX O

Table 13

PHYSICOCHEMICAL PARAMETERS FOR CORN CREEK AND BAREBONE CREEK WATERS, AUGUST 1975[a]

Date	Station	Carbonate Hardness	Noncarbonate Hardness	Bicarbonate Alkalinity	Carbonate Alkalinity	Temperature °C	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho/cm²	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended Solids	COD	NH_4
11 Aug 1975	1	256	36	208	12	23.1	7.9	1.0	5.3	500	--	--	--	--	--	-	--	--	0.57	--	0.05	-	--	-	-
	2	296	18	266	12	23.0	7.8	5.0	5.9	570	--	--	--	--	--	-	--	--	0.64	--	0.12	-	--	-	-
	3	280	6	262	12	21.6	7.6	3.0	2.2	530	--	--	--	--	--	-	--	--	0.62	--	0.07	-	--	-	-
	4	282	6	264	12	22.0	7.9	1.8	6.3	560	--	--	--	--	--	-	--	--	0.68	--	0.05	-	--	-	-
	5	277	9	256	12	23.0	7.75	1.0	5.5	540	--	--	--	--	--	-	--	--	0.17	--	0.05	-	--	-	-
	6	Dry	--	-	--	--	--	-	-	-	--	--	--	--	--	-	--	--	--	--	--	-	--	-	-
	7	-	--	232	12	22.3	7.6	-	4.5	520	--	--	--	--	--	-	--	--	--	--	--	-	--	-	-
24 Aug 1975	1	253	15	230	8	26.0	8.1	2.8	4.5	500	62.2	23.7	4.0	2.2	0	0	35.7	11.9	1.10	0.031	0.15	308	6	-	0
	2	280	13	223	44	26.0	8.3	6.1	4.6	540	72.0	24.4	3.9	3.0	0.08	0	33.7	7.9	0.87	0.024	0.175	374	15	-	0
	3	268	8	252	8	25.0	8.2	5.2	3.6	540	69.2	23.2	3.8	2.4	0.24	0	23.6	8.9	0.66	0.020	0.07	332	13	-	0
	4	248	-4	188	64	25.0	8.3	4.2	4.6	500	62.5	22.5	3.8	2.4	0.24	0	23.6	7.9	0.95	0.022	0.125	308	18	-	0
	5	264	20	244	0	27.0	7.9	3.0	3.6	520	70.2	21.6	4.3	2.3	0	0	35.1	8.5	0.66	0.050	0.215	310	13	-	0
	6	Dry	--	-	--	--	-	-	-	-	--	--	-	-	--	-	--	-	--	--	--	-	--	-	-

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

Table 1

PHYSICOCHEMICAL PARAMETERS OF CORN AND BAREBONE CREEKS, AND THE OXBOW, SEPTEMBER 1975[a]

	Date	Station	Discharge m^3/sec	Carbonate hardness	Noncarbonate hardness	Bicarbonate alkalinity	Carbonate alkalinity	Temperature C	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho/cm2	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended solids	COD	BOD_5	Fecal coliforms organisms/100 ml	NH_4
Corn and Barebone creeks	5 Sept 75	1	Dry	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	-----	---	------	-
		2	---	304	26	262	16	25	8.2	5.4	5.5	565	----	----	----	----	----	---	----	----	0.68	-----	0.23	---	--	-----	---	------	0
		3	---	314	25	289	0	23	7.9	4.3	5.2	565	----	----	----	----	----	---	----	----	0.70	-----	0.21	---	--	-----	---	------	0
		4	---	302	26	276	0	23	7.9	2.7	2.6	565	----	----	----	----	----	---	----	----	0.46	-----	0.21	---	--	-----	---	------	0
		5	---	322	74	248	12	24	8.2	4.7	4.6	525	----	----	----	----	----	---	----	----	0.48	-----	0.21	---	--	-----	---	------	0
		6	Dry	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	-----	---	------	-
	11 Sept 75	1	Dry	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	-----	---	------	-
		2	---	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	17.6	2.1	1,700	-
		3	---	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	7.8	2.0	800	-
		4	---	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	11.8	1.9	200	-
		5	---	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	121.6	2.6	400	-
		6	Dry	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	-----	---	------	-
		7	---	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	203.9	4.9	50,000	-
	23 Sept 75	1	---	245	41	198	0	16	7.4	1.2	10.4	440	57.7	23.8	3.6	1.6	0.14	0.0	49.8	9.5	1.17	0.010	0.12	276	6	-----	---	------	0
		2	---	299	39	260	0	16	7.2	11.0	7.2	530	76.3	25.7	3.3	1.8	0.40	0.0	37.1	7.0	0.84	0.015	0.28	338	32	-----	---	------	0
		3	---	274	12	262	0	14	7.0	6.2	3.4	540	70.3	23.4	3.1	2.4	0.34	0.0	20.9	8.5	0.79	0.024	0.09	322	14	-----	---	------	0
		4	---	268	5	263	0	14	7.3	6.5	7.3	540	66.3	24.2	3.2	2.6	0.34	0.0	18.9	7.0	0.84	0.032	0.10	310	11	-----	---	------	0
		5	---	269	29	240	0	14	7.3	3.3	6.6	420	70.7	21.9	2.9	2.1	0.22	0.0	31.0	8.5	0.95	0.018	0.09	320	11	-----	---	------	0
		6	Dry	---	---	---	--	--	---	----	----	---	----	----	----	----	----	---	----	----	----	-----	----	---	--	-----	---	------	0

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975a

APPENDIX O

Table 15

PHYSICOCHEMICAL PARAMETERS FOR CORN CREEK AT THE TRIMBLE COUNTY GENERATING PLANT SITE, OCTOBER 1975[a]

	Date	Station	Carbonate Hardness	Noncarbonate Hardness	Bicarbonate Hardness	Carbonate Alkalinity	Temperature °C	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended Solids	COD	NH_4
Corn Creek	9 Oct 1975	1	254	56	198	0	17	8.0	4.6	9.2	550	-	-	-	-	-	-	-	-	0.26	-	0.15	-	-	-	0
		2	230	44	186	0	17	7.9	8.6	8.2	430	-	-	-	-	-	-	-	-	0.24	-	0.15	-	-	-	0
		3	218	40	178	0	16.5	7.9	14.0	7.8	500	-	-	-	-	-	-	-	-	0.16	-	0.34	-	-	-	0
		4	216	39	177	0	17	8.0	13.0	7.2	450	-	-	-	-	-	-	-	-	0.185	-	0.22	-	-	-	0
		5	254	72	182	20	19	8.1	6.4	8.0	620	-	-	-	-	-	-	-	-	0.215	-	0.16	-	-	-	0
		6	192	39	153	0	18	8.1	1.5	8.6	420	-	-	-	-	-	-	-	-	0.170	-	0.15	-	-	-	0
Corn Creek	22 Oct 1975	1	248	36	212	0	15	7.9	3.0	10.0	530	58.5	24.8	3.9	1.6	0	0	32.6	7.0	1.34	0.019	0.14	298	5	2.8	0
		2	268	34	234	0	15	7.6	3.0	9.4	660	66.7	24.7	3.6	1.6	0	0	22.3	7.0	0.92	0.018	0.20	324	6	2.8	0
		3	276	42	234	0	16	7.5	2.0	7.2	465	69.7	24.8	3.5	1.6	0	0	18.2	6.0	0.75	0.020	0.21	324	30	3.0	0
		4	274	54	220	0	16	7.5	4.0	7.0	495	68.5	25.1	3.8	1.8	0	0	15.2	6.0	0.88	0.011	0.20	336	12	5.0	0
		5	290	51	239	4	16	7.9	3.0	9.6	670	76.7	23.9	4.7	1.8	0	0	18.2	7.0	1.83	0.010	0.15	352	16	6.0	0
		6	284	66	218	28	16	8.0	3.0	9.6	550	74.7	23.8	4.6	1.9	0	0	14.2	8.0	1.43	0.011	0.12	338	8	2.0	0

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975b

APPENDIX O

Table 16

PHYSICOCHEMICAL PARAMETERS FOR CORN CREEK AT THE TRIMBLE COUNTY GENERATING PLANT SITE, NOVEMBER 1975[a]

Stream	Date	Station	Carbonate Hardness	Noncarbonate Hardness	Bicarbonate Alkalinity	Carbonate Alkalinity	Temperature	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended Solids	COD	NH_4
Corn Creek	14 Nov '75	1	294	64	230	0	10	7.9	10.0	7.8	480	--	--	--	-	--	-	---	--	0.73	---	0.09	-	--	--	0
		2	286	56	230	0	10	7.9	8.0	9.8	500	--	--	--	-	--	-	---	--	0.88	---	0.10	-	--	--	0
		3	298	58	240	0	11	8.0	8.0	7.6	510	--	--	--	-	--	-	---	--	0.84	---	0.14	-	--	--	0
		4	296	50	246	0	11	7.8	10.0	8.8	490	--	--	--	-	--	-	---	--	0.59	---	0.09	-	--	--	0
		5	318	69	249	0	11	8.0	12.0	8.9	590	--	--	--	-	--	-	---	--	0.66	---	0.12	-	--	--	0
		6	296	46	250	0	10	8.0	10.0	7.9	575	--	--	--	-	--	-	---	--	0.81	---	0.09	-	--	--	0
Corn Creek	23 Nov '75	1	250	18	232	0	5	7.7	1.4	13.1	480	54.5	27.7	4.4	1.4	0.24	0	37.8	7.2	0.05	0.001	0.43	274	10	25	0
		2	269	25	244	0	5	8.1	2.5	13.4	500	64.0	26.7	3.8	1.6	0.34	0	35.7	8.0	0.05	0.013	0.09	310	5	29	0
		3	268	22	246	0	5	7.9	3.2	12.8	540	63.3	26.7	3.9	1.6	0.42	0	33.5	10.0	0.09	0.013	0.07	318	10	35	0
		4	273	15	258	0	5	7.9	4.0	10.6	520	64.5	27.2	3.9	1.6	0.24	0	20.9	7.5	0.15	0.015	0.09	310	10	42	0
		5	271	21	250	0	4	8.2	2.8	13.6	500	68.0	24.7	4.5	1.5	0.34	0	31.4	9.0	0.09	0.015	0.07	324	4	86	0
		6	-	--	-	-	--	-	--	--	-	--	--	-	-	--	-	---	--	--	---	--	-	--	--	-

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975b

APPENDIX O

Table 17

PHYSICOCHEMICAL PARAMETERS FOR CORN CREEK AT THE TRIMBLE COUNTY GENERATING PLANT SITE, DECEMBER 1975[a]

Date	Station	Carbonate Hardness	Noncarbonate Hardness	Bicarbonate Alkalinity	Carbonate Alkalinity	Temperature C°	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended Solids	COD	NH_4
5 Dec '75	1	282	62	220	0	6.0	7.9	4.1	11.8	600	--	--	--	-	--	-	--	--	1.17	---	0.49	-	-	--	0
	2	296	54	242	0	5.0	8.1	2.0	12.8	650	--	--	--	-	--	-	--	--	2.57	---	0.27	-	-	--	0
	3	300	84	216	0	5.0	7.8	1.9	12.0	625	--	--	--	-	--	-	--	--	1.10	---	1.1	-	-	--	0
	4	304	69	235	0	5.0	8.1	2.5	11.8	700	--	--	--	-	--	-	--	--	1.61	---	0.3	-	-	--	0
	5	326	66	260	0	8.0	8.0	2.5	12.8	700	--	--	--	-	--	-	--	--	1.14	---	0.45	-	-	--	0
	6	328	72	256	0	5.0	8.3	3.5	13.8	700	--	--	--	-	--	-	--	--	0.92	---	0.22	-	-	--	0
15 Dec '75	1	149	21	128	0	11.0	7.8	73.0	10.6	390	34.2	15.5	2.0	2.9	0.20	0	38.8	8.5	1.47	0.13	0.38	306	134	32.4	0
	2	170	14	156	0	11.0	8.2	78.0	10.9	440	40.2	17.0	2.2	2.8	0.40	0	55.8	8.0	2.42	0.01	0.40	412	236	33.5	0
	3	200	38	162	0	11.5	8.1	76.0	11.2	520	47.0	20.0	2.1	1.8	0.60	0	62.4	6.5	2.38	0.013	0.22	446	256	36.4	0
	4	204	16	188	0	11.0	8.1	80.0	11.8	535	48.2	20.4	2.3	1.8	0.40	0	52.3	7.5	2.75	0.013	0.21	682	420	32.9	0
	5	141	9	132	0	10.0	8.1	83.0	10.8	370	34.5	13.5	2.2	2.6	0.40	0	64.1	8.0	2.93	0.01	0.34	440	284	32.8	0
	6	176	11	165	0	11.0	8.0	86.0	11.2	460	43.2	16.9	3.6	2.7	0.40	0	57.4	5.5	4.55	0.011	0.42	640	428	38.9	0

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1975b

APPENDIX O

Table 18

PHYSICOCHEMICAL PARAMETERS FOR NORTH, SOUTH, AND CORN CREEKS AT THE TRIMBLE COUNTY GENERATING PLANT SITE, FEBRUARY, MARCH, AND APRIL, 1976[a]

Station	Date	Carbonate Hardness	Noncarbonate Hardness	Carbonate Alkalinity	Bicarbonate Alkalinity	Temperature °C	pH	Turbidity NTU	Dissolved Oxygen	Conductivity µmho	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Sulfate	Chloride	Phosphate	Nitrite	Nitrate	Total Residue	Suspended Solids
North Creek	4 Feb 76	240	18	0	222	3.0	8.1	8.0	13.4	470	65.5	26.5	1.9	1.2	0.2	0	71.7	6.5	0.95	0.006	0.39	334	22
South Creek	4 Feb 76	262	40	0	222	3.0	7.9	2.5	13.6	460	61.0	26.6	1.4	0.8	0.1	0	50.5	7.5	0.62	0.006	0.49	308	4
Corn Creek 1	18 Feb 76	148	22	0	126	10.0	7.7	40.0	12.0	360	36.5	13.9	2.0	3.7	0.2	0	37.8	9.5	1.21	0.003	0.30	204	41
Corn Creek 2	18 Feb 76	162	31	0	131	10.0	7.4	42.0	10.8	395	40.5	14.7	2.0	4.1	0.3	0	22.7	5.5	1.32	0.005	0.28	254	68
Corn Creek 3	18 Feb 76	146	16	0	130	10.0	7.7	52.0	10.4	325	37.2	13.0	1.8	4.1	0.1	0	35.7	3.9	1.06	0.006	0.28	248	80
Corn Creek 4	18 Feb 76	166	42	0	124	10.0	7.7	53.0	10.8	340	45.0	13.1	1.8	5.0	0.1	0	25.0	4.2	1.10	0.008	0.25	236	94
North Creek	9 Mar 76	308	60	0	248	8.0	7.6	2.6	11.2	650	73.0	30.6	4.6	2.3	0.2	0	73.8	3.9	0.49	0.010	0.39	354	11
South Creek	9 Mar 76	297	57	0	240	8.0	7.6	3.5	11.7	650	70.2	29.5	3.9	1.8	0.3	0	39.9	4.9	0.71	0.010	1.45	314	12
Corn Creek 1	9 Mar 76	242	32	0	210	10.0	7.5	2.2	10.8	480	55.0	25.5	3.4	2.0	0.1	0	35.6	8.5	0.44	0.005	0.13	260	5
Corn Creek 2	9 Mar 76	254	38	0	216	8.0	7.9	2.0	11.4	450	60.2	25.2	3.2	2.1	0.2	0	39.9	6.9	0.31	0.005	0.21	292	7
Corn Creek 3	9 Mar 76	256	36	0	220	8.0	7.7	4.0	11.4	460	62.5	24.2	3.3	2.1	0.6	0	37.8	7.9	0.24	0.008	0.16	286	14
Corn Creek 4	9 Mar 76	270	50	0	220	8.0	7.5	5.5	11.4	480	65.0	26.2	3.2	2.1	0.4	0	42.0	11.5	0.49	0.006	0.45	294	14
North Creek	6 Apr 76	273	71	0	202	14.0	8.2	4.0	13.0	550	58.2	31.1	4.2	2.1	0.1	0	56.8	5.0	0.37	0.006	0.28	326	5
South Creek	6 Apr 76	248	10	0	238	14.0	8.1	2.0	11.6	800	59.2	24.3	3.8	1.8	0.1	0	25.0	6.9	0.16	0.013	0.19	318	2
Corn Creek 1	6 Apr 76	275	39	0	236	11.0	8.0	2.0	10.8	520	60.5	30.1	3.3	1.7	0.2	0	37.8	11.2	0.44	0.006	0.32	270	6
Corn Creek 2	6 Apr 76	293	87	0	206	10.0	8.1	1.3	11.6	500	69.5	29.3	3.1	2.2	0.3	0	46.2	6.2	0.66	0.006	0.42	284	5
Corn Creek 3	6 Apr 76	270	84	0	186	10.0	8.3	2.5	10.4	475	59.5	29.7	3.1	2.2	0.2	0	42.0	4.9	0.33	0.010	0.27	304	1
Corn Creek 4	6 Apr 76	278	44	0	234	12.0	8.0	5.0	8.6	575	60.7	30.7	3.1	2.4	0.3	0	44.1	9.5	0.26	0.010	0.22	296	1

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[a] All measurements are in parts per million (ppm - mg/liter) unless otherwise noted.

Source: University of Louisville, 1976a

APPENDIX P

AQUATIC SAMPLING LOCATIONS
(Corn and Barebone Creeks)

Station 1 - On Corn Creek just downstream from the culvert that carries State Highway 625 across the stream. The station lies about a half-mile (0.8 km) east of the intersection of State Highways 625 and 1488. At that point, the stream is about 10 m wide and the riffle is about 75 m long. The width of the stream and the length of the riffle are radically changed during times of heavy rainfall; during April 1975, the stream overtopped its banks and carried debris as many as 10 to 15 m into the adjacent fields. The substrate consists of limestone slabs, rubble, and gravel that rest on bedrock. The stream is bordered on the north and west by cultivated fields and on the south and east by forested hillsides. State Highway 625 lies within 10 m of the stream along its eastern bank. The depth of the stream varies drastically with rainfall; during April 1975 there were depths of nearly 2 m, but at normal low flow the average depth is about 20 cm. During May, the channel of Corn Creek was modified to enhance the flow of the stream. As a result, Station 1 was moved about 100 m upstream from the culverts for Highway 625. The station is about 70 m long and includes a riffle at the upper end that flows into a pool 1 to 1.5 m deep, which in turn empties into an evenly bottomed riffle about 40 m long. The bottom of the entire station is covered with gravel and rubble with some silt in the bottom of the pool. The pool is overhung on the east bank by a large sycamore tree. The stream is about 2 to 3 m wide above the pool and 4 to 5 m wide below. The pool is about 3 m wide and 7 m long. At extreme low flow, the width and depth of the stream are much smaller.

Station 2 - On Corn Creek along the right-of-way for State Highway 1488 about 2.8 miles (4.5 km) downstream from Station 1. There, the stream is about 10 m wide and the riffle is about 25 m long. The substrate consists of gravel and small rocks. At low flow during April 1975, the depth at the riffle ranged to 30 cm and the pool below the riffle was about 1 m deep. During April 1975, following heavy rains, this station was within the backwaters of the Ohio River. The station is bordered on the west by a high bank that serves as the right-of-way for State Highway 1488 and by forested hillsides. On the east are cultivated fields.

Station 3 - On Corn Creek near the bridge for State Highway 1488. There, the stream is about 7 m wide and there is a short riffle about 4 m long. The substrate consists of large rocks and rubble with some silt and sand. The channel of the stream is confined by high banks which rise to more than 76 m along the south side but no more than 6 m on the north. The south hillside is heavily forested and there are scattered trees along the north bank beyond which are cultivated fields. This station is within the plant site.

Station 4 - On Corn Creek about midway between Station 3 and the mouth. This station is about a quarter mile (0.4 km) downstream from the point of the proposed diversion. Here, the stream is about 12 m wide and is within the area of permanent backwater of the Ohio River. The substrate is deep sediment that apparently has resulted from many years of deposition from the upper reaches of Corn Creek since the formation of the McAlpine Pool. The banks of the stream support a few trees, but the area through which the stream flows is cultivated. The stream in this vicinity is more than 2 m deep and there does not appear to be any firm bottom. The bottom muds reflect a long-time accumulation of allochthonous detritus.

Station 5 - On Barebone Creek along State Highway 754 about 0.8 mile (1.2 km) above its juncture with State Highway 1488. There, the stream is about 8 m wide and there is a riffle about 16 m long and during normal flow is about 20 cm deep. The substrate is rubble and gravel and the banks of the stream are wooded with pastureland beyond. State Highway 754 is about 45 m from the stream.

Station 6 - On Barebone Creek from the bridge for State Highway 754 to the mouth of Carters Branch. There, the stream is about 11 m wide and about 20 to 30 cm deep under normal conditions. This area lies within the upper backwater area of the Ohio River and the bottom is soft silt and sand. There is no riffle in the area. The stream is bordered by wooded areas with some pastureland beyond. To the west of the area is Wises Landing. During April 1975, the area was inundated by the backwaters of the Ohio River and State Highway 1488 was under about 1 m of water.

Station 7 - This is the old oxbow of Corn Creek and was the original channel of the stream prior to its diversion before 1950. A narrow channel connects the oxbow with the Ohio River, but during April 1975, the outlines of the oxbow were completely submerged by the backwaters of the river. The bottom of the oxbow is soft mud and sand with much decaying allochthonous detritus from the trees that border the banks. Much of the surrounding area is wooded and apparently is too low for consistent agricultural practice.

APPENDIX Q

AQUATIC TABLES

APPENDIX Q

Table 1

RELATIVE ABUNDANCE (%, UPPER FIGURE), DENSITY (#/LITER, LOWER FIGURE), AND DIVERSITY OF PLANKTON IN 20 LITER SAMPLES OF WATER TAKEN FROM THE OHIO RIVER, 1 JULY 1975

Sample Station	Depth (m)	*Asterionella formosa*	*Melosira granulata*	*Melosira italica*	*Melosira spp.*	*Synedra ulna*	*Synedra acus*	*Surirella ovata*	*Surirella striatula*	*Nitzschia tryblionella*	*Navicula cryptocephala*	*Navicula peregrina*	*Navicula sp.*	*Cyclotella pseudostelligera*	*Cyclotella meneghiniana*	*Cyclotella spp.*	*Tabellaria fenestrata*	*Melosira ambigua*	*Fragilaria crotonensis*	*Melosira varians*	*Diatoma elongatum*	*Cocconeis spp.*	*Diatoma vulgare*	*Dictyosphaeria curvata*	*Zygnema sp.*	*Scenedesmus dimorphus*	*Staurastrum paradoxum*	*Pediastrum boryanum*	*Pediastrum duplex*	*Ceratium sp.*	Brillouin's Diversity
Upper Transect Kentucky side	1	16.7 868.0	33.3 1736.2	8.3 434.0		8.3 434.0								8.3 434.0		16.7 868.0	8.3 434.0														1.8
Upper Transect Kentucky side	2	15.8 1302.0	21.0 1736.0	15.8 1302.0			5.3 434.0							10.5 868.0	15.8 1302.0	10.5 868.0							5.3 434.0								2.3
Upper Transect Kentucky side	3	25.9 3038.2	11.1 1302.0	11.1 1302.0	3.7 434.0	7.4 868.0	7.4 868.0							7.4 868.0		22.2 2604.0	*									3.7 434.0					2.3
Upper Transect Indiana side	1	15.0 1282.0	10.0 854.6	25.0 2136.8	3.0 427.4		5.0 427.4							5.0 427.4	20.0 8547.0			10.0 855.0							5.0 427.0						2.2
Upper Transect Indiana side	2	33.3 5128.2	16.6 2564.0	8.3 1282.0			2.8 427.4							2.8 427.4	19.4 2991.4	8.3 1282.0								2.8 427.0					2.8 427.0	2.8 427.0	2.2
Upper Transect * Indiana side	3	*	*	*		*		*		*	*	*			*				*	*	*	*					*	*		*	—
Lower Transect Middle	1	*	*				*	*					*		*			*	*									*	*	*	—
Lower Transect Middle	2	*	*	*		*								*		*	*										*		*		—
Lower Transect Middle	3	[illegible] 3038.2	24.5 [illegible]	3.9 868.0		2.9 434.0	8.8 1302.0		2.9 434.0		5.9 868.0			2.9 427.4	5.9 868.0	17.6 2604.0															2.4

* Designates presence (in non-quantitative samples)

Source: University of Louisville, 1975a

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APPENDIX Q

Table 2

RELATIVE ABUNDANCE (%, UPPER FIGURE), DENSITY (#/LITER, LOWER FIGURE), AND DIVERSITY OF PLANKTON IN 20 LITER SAMPLES OF WATER TAKEN FROM THE OHIO RIVER, 12 AUGUST 1975

Sample Station	*Asterionella formosa*	*Melosira ambigua*	*Melosira italica*	*Melosira granulata*	*Pediastrum simplex*	*Pediastrum duplex*	*Cyclotella* spp.	*Navicula* sp.	*Merismopedia* sp.	*Pandorina* sp.	*Cocconeis* sp.	*Cosmarium* sp.	*Synedra acus*	*Cyclotella meneghiniana*	*Pediastrum boryanum*	*Synedra ulna*	*Scenedesmus armatus*	*Gyrosigma* sp.	*Diatoma vulgare*	*Staurastrum paradoxum*	*Holopedium geminatum*	*Surirella striatula*	*Rhopalodia gibberula*	*Polycistis* sp.	*Spirogyra* sp.	*Nitzschia* sp.	*Melosira islandica*	*Tetraedron* sp.	Diversity Index
Upper Transect Indiana side	7.7 434	7.7 434	7.7 434	7.7 434	7.7 434	7.7 434	7.7 434	7.7 434	7.7 434	7.7 434	7.7 434	7.7 434	7.7 434																2.5
Upper Transect Middle	26 2604	8.7 686		4.3 434	8.7 868	4.3 434	17.4 1736	4.3 434					4.3 434	8.7 868	4.3 434	4.3 434	4.3 434												2.49
Upper Transect Kentucky side	44.4 3472	16.7 1302	11.1 868	11.1 868	11.1 868		5.5 434										5.5 434	5.5 434											1.81
Middle Transect Indiana side	11.1 434				11.1 434		11.1 434	11.1 434	11.1 434								11.1 434		22.2 868	11.1 434									1.94
Middle Transect Middle		5.5 434		5.5 434	33.3 2604	5.5 434	5.5 434		5.5 434					5.5 434							16.6 1302	5.5 434	5.5 434	5.5 434					2.25
Middle Transect Kentucky side		6.3 434		6.3 434	6.3 434	6.3 434			12.5 868					12.5 868			6.3 434				25 1736		12.5 868		6.3 434				2.29
Lower Transect Indiana		7.7 434			7.7 434		15.4 868	15.4 868				15.4 868	7.7 434											15.4 868		15.4 868			2.12
Lower Transect Middle		22.2 1736	5.5 434		22.2 1736		5.5 434							5.5 434		11.1 868	11.1 868							5.5 434			5.5 434	5.5 434	2.3
Lower Transect Kentucky		23.5 1736		5.9 434	23.5 1736	5.9 434	5.9 434							5.9 434			5.9 434			5.9 434	11.8 868						5.9 434		2.25

Source: University of Louisville, 1975a

APPENDIX Q

Table 3

RELATIVE ABUNDANCE (%, UPPER FIGURE), DENSITY (#/LITER, LOWER FIGURE), AND DIVERSITY OF PLANKTON IN 20 LITER SAMPLES OF WATER TAKEN FROM THE OHIO RIVER, 24 SEPTEMBER 1975

Station	*Melosira granulata*	*Melosira ambigua*	*Melosira varians*	*Melosira italica*	*Cyclotella meneghiniana*	*Cyclotella* sp.	*Scenedesmus armatus*	*Diatoma vulgare*	*Pediastrum duplex*	*Pediastrum simplex*	*Pinnularia* sp.	*Tabellaria fenestrata*	*Navicula cryptocephala*	*Synedra ulna*	*Microspora* sp.	*Oscillatoria* sp.	*Asterionella formosa*	*Tetraedron* sp.	*Cymbella tumida*	*Navicula* sp.	Diversity Index
Upper Transect Indiana side	--------	NOT AVAILABLE	--------------																		
Upper Transect Middle	44.4 1736	22.2 868			11.1 434		11.1 434	11.1 434													1.43
Upper Transect Kentucky side	14.3 868	21.4 1302			14.3 868				7.1 434		7.1 434	7.1 434	14.3 868	14.3 868							2.13
Middle Transect Indiana side	22.2 868			11.1 434	11.1 434	11.1 434								11.1 434	11.1 434	11.1 434				11.1 434	1.94
Middle Transect Middle	6.2 434	6.2 434	6.2 434		18.7 1302	18.7 1302	6.2 434			6.2 434			6.2 434	12.5 868			6.2 434	6.2 434			2.38
Middle Transect Kentucky side	33.3 1302		33.3 1302	22.2 868	11.1 434																1.37
Lower Transect Indiana side	27.3 1302	9.1 434		18.2 868	9.1 434						9.1 434		9.1 434	18.2 868							1.88
Lower Transect Middle		18.2 868			18.2 868	36.4 1736						27.3 1302									1.46
Lower Transect Kentucky side	12.5 434	12.5 434				25.0 868	25.0 868				12.5 434								12.5 434		1.66

Source: University of Louisville, 1975a

APPENDIX Q

Table 4

RELATIVE ABUNDANCE (%, UPPER FIGURE), DENSITY (#/LITER, LOWER FIGURE), AND DIVERSITY OF PLANKTON IN 20 LITER SAMPLES OF WATER TAKEN FROM THE OHIO RIVER, 23 OCTOBER 1975

Stations	*Melosira granulata*	*Melosira islandica*	*Melosira italica*	*Melosira varians*	*Cyclotella* spp.	*Synedra ulna*	*Synedra acus*	*Synedra rumpens*	*Fragilaria crotonensis*	*Diatoma* sp.	*Rhoicosphenia curvata*	*Navicula* sp.	*Scenedesmus armatus*	*Stephanodiscus* sp.	*Asterionella formosa*	*Ulothrix* sp.	*Cymbella affinis*	*Pediastrum simplex*	*Nitzschia* sp.	*Surirella ovata*	*Cymbella* sp.	Diversity
Upper transect Indiana side	22.2 3472	11.1 1736			11.1 1736	11.1 1736			11.1 1736	11.1 1736	11.1 1736	11.1 1736										2.95
Upper transect Middle		11.1 1736		22.2 3472		22.2 3472			11.1 1736		11.1 1736	22.2 3472										2.50
Upper transect Kentucky side	9.1 1302	18.2 2604	9.1 1302	27.3 3906					9.1 1302		9.1 1302		9.1 1302	9.1 1302								2.84
Middle transect Indiana side	14.2 2604		7.1 1302	7.1 1302	21.4 3906	21.4 3906			7.1 1302			7.1 1302	7.1 1302		7.1 1302							2.98
Middle transect Middle		16.7 2604	16.7 2604		8.3 1302	25 3906						25 3906			8.3 1302							2.46
Middle transect Kentucky side		11.1 1302			11.1 1302	11.1 1302	22.2 2604	11.1 1302	11.1 1302			11.1 1302				11.1 1302						2.95
Lower transect Indiana side	15.4 2604		7.7 1302		15.4 2604	7.7 1302	7.7 1302		7.7 1302			15.4 2604			7.7 1302		15.4 2604					3.09
Lower transect Middle	7.1 1736	14.3 3472			14.3 3472	21.4 5208			28.6 6944									7.1 1736	7.1 1736			2.61
Lower transect Kentucky side		11.1 1302		22.2 2604			11.1 1302		11.1 1302			11.1 1302						11.1 1302		11.1 1302	11.1 1302	2.95

Source: University of Louisville, 1975b

APPENDIX Q

Table 5

TOTAL BIOMASS OF PLANKTON IN 20 LITER WATER SAMPLES TAKEN FROM THE OHIO RIVER, AT THREE TRANSECTS (RIVER MILES 570, 571, AND 573.1)

SAMPLE SITE	DRY WEIGHT mg/20 l	ASH WEIGHT mg/20 l	ASH-FREE DRY WEIGHT mg/l
Upper Transect Kentucky side	8.5	5.6	0.145
Upper Transect Middle	22.8	9.3	0.675
Upper Transect Indiana side	28.8	22.4	0.32
Middle Transect Kentucky side	10.4	5.2	0.26
Middle Transect Middle	13.5	7.7	0.29
Middle Transect Indiana side	8.5	5.4	0.155
Lower Transect Kentucky side	9.7	2.1	0.38
Lower Transect Middle	15.0	7.5	0.375
Lower Transect Indiana side	12.3	5.8	0.325

Source: University of Louisville, 1975a

APPENDIX Q

Table 6

NUMBERS OF VARIOUS ORGANISMS IN PONAR BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM THE OHIO RIVER, 28 AND 29 MAY 1975

			TAXONOMIC GROUPS																						
			Trichoptera				Ephemer-optera		Diptera																
Transect	Station	No. of samples	*Cheumatopsyche*	*Potamyia*	*Rhyacophila*	*Hydropsyche*	*Stenonema*	*Pseudiron*	Chironomidae	Ceratopogonidae	*Gammarus*	Oligochaeta	Nematoda	*Corbicula*	*Megalonaias*	*Perlesta*	*Amphiagrion*	*Turbellaria*	*Hydracarina*	Isopoda	Copepoda	Total	Number of Taxa	Diversity	Number per square meter
Lower	Ind	2	1								3											4	2	0.50	38.68
	Mid	2							29			300	100	4								433	4	1.15	4187.11
	Ky	2							1													1	1	0.00	9.67
Middle	Ind	3**	6				2		2			23		3	1							37	6	1.48	238.65
	Mid	2							1	4		2000*		42								2047	4	0.17	20,000.00
	Ky	2						1	50					2								53	3	0.30	512.51
Upper	Ind	3**	1	3	2	1	1		12		5	2	2	1		1	1	3	1	3	1	40	16	2.82	258.00
	Mid	2							16	5		60	30	1								112	5	1.56	1083.04
	Ky	2												7								7	1	0.00	67.69
		Tot	8	3	2	1	3	1	111	9	8	2385	132	60	1	1	1	3	1	3	1	2734	19	0.83	2644.08

* more than 2,000 estimated

** Ponar sampler will not collect a proper sample in these areas because of the nature of the substrate (large rocks, gravel, rubble, etc.)

Source: University of Louisville, 1975a

APPENDIX Q

Table 7

NUMBERS OF ORGANISMS IN PONAR SAMPLES, TRANSECTS 1-3 OF THE OHIO RIVER (UPPER = RM 570; MIDDLE = RM 571; LOWER = RM 574) AND EKMAN SAMPLES OF STATIONS 4 AND 7, JULY 8 AND 23, 1975

		TAXONOMIC GROUPS													
Transect	Station	Oligochaeta	*Corbicula*	Chironomidae	*Chaoborus*	Ceratopogonidae	Hirudinea	*Potamyia flava*	*Chimarra*	*Stenelmis*	*Gammarus*	No. of organisms	No. of taxa	Diversity	Number/m^2
Upper Mile 570	Ky side 1		1									1	1	0	67.7
	Ky side 2	6										6	1	0	
	Middle 1	2	10	2								14	3	0.90	203.1
	Middle 2		5	2								7	2	0.63	
	Ind side 1	31		3			1					35	3	0.51	1150.7
	Ind side 2	79	4								1	84	3	0.32	
Middle Mile 571	Ky side 1	3										3	1	0	203.1
	Ky side 2	12	2	2	2							18	4	1.15	
	Middle 1		1	2				3				6	3	0.98	145.1
	Middle 2		1					6	2			9	3	0.89	
	Ind side 1	5	67				1					73	3	9.41	773.6
	Ind side 2		5	2								7	2	0.63	
Lower Mile 574	Ky side 1	5	1									6	2	0.43	116.0
	Ky side 2	2	4									6	2	0.65	
	Middle 1	2										2	1	0	183.7
	Middle 2		8	6		2				1		17	4	1.33	
	Ind side 1	7	8									15	2	0.84	744.6
	Ind side 2	1	61									62	2	0.09	
	Total	155	178	19	2	2	2	9	2	1	1	371			

APPENDIX Q

Table 7 (Continued)

	TAXONOMIC GROUPS													
	Oligochaeta	*Corbicula*	Chironomidae	*Chaoborus*	Ceratopogonidae	Hirudinea	*Potamyia flava*	*Chimarra*	*Stenelmis*	*Gammarus*	No. of organisms	No. of taxa	Diversity	Number/m^2
Oxbow (Sta.7)	157		1								158	2	0.04	3023
Oxbow (Sta.7)	314		2								316	2	0.05	6047
Total	471		3								474			9070
8 July 1975														
Corn Creek 4	5		8	3							16	3	1.22	306.1
Corn Creek 4	7		18	4							29	3	1.15	554.7
Total	12		26	7							45			860.8

Source: University of Louisville, 1975a

APPENDIX Q

Table 8

NUMBERS OF VARIOUS ORGANISMS IN PONAR BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM THE OHIO RIVER, 12 AUGUST 1975

Transect	Station	*Corbicula*	Oligochaeta	Chironomidae	*Physa*	*Chaoborous*	*Gomphus*	*Stenonema*	Hydra	Isopoda	*Cheumatopsyche*	*Cyrnellus fraternus*	*Pl maria*	Hirudinea	Libellulidae	Total	No. of taxa	Diversity	No./square meter
Upper	Indiana	9	3													12	2	.648	116
	Middle	171		1												172	2	.043	1,663
	Kentucky	90	1	1	1	2	1									96	6	.399	928
Middle	Indiana		5	1				4	6	1						17	5	1.609	164
	Middle	1172		24		1					2					1199	4	.163	11,594
	Kentucky	96		5		1										102	3	.323	986
Lower	Indiana	516	20	3		1						1	1	3		545	7	.360	5,270
	Middle	723														723	1	0	6,991
	Kentucky	95	28	10				1	1		2				1	138	7	1.26	1,334
	Total	2872	57	45	1	5	1	5	7	1	4	1	1	3	1	3004	14		3,228

Source: University of Louisville, 1975a

APPENDIX Q

Table 9

NUMBERS OF VARIOUS ORGANISMS IN PONAR BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM THE OHIO RIVER, 22 SEPTEMBER 1975

Transect	Station	Number of Samples	*Corbicula*	Oligochaeta	Chironomidae	Ceratopogonidae	Paetinae	*Caenis*	*Cheumatopsyche*	*Hydropsyche*	*Stenonema*	Adult Trichoptera	Total	# of taxa	Diversity	#/m^2
Upper	Ind.		32											1	0	
	Mid.		1,679	33	8		1	1	2		1		1,725	7	.21	16,681
	Ky.		35		1			1					37	3	.28	358
Mid	Ind.		5	5	6							1	17	4	1.47	164
	Mid.		256	4	4				8				272	4	.38	2,630
	Ky.		3		12	1							16	3	.8	155
Lower	Ind.		10			1							11	2	.31	106
	Mid.		199			12							211	2	.3	2,040
	Ky.		91	8	4					2	3		108	5	.81	1,044
															Mean =	2,897

Source: University of Louisville, 1975a

Table 10

NUMBERS OF VARIOUS ORGANISMS IN PONAR BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM THE OHIO RIVER, 22 OCTOBER 1975

Transect	Station	No. of samples	*Corbicula*	Chironomidae	Oligochaeta	*Agraylea*	*Gammarus*	Tricladia	*Valvata*	*Sphaerium*	*Cheumatopsyche*	*Chaoborous*	*Brezzia*	Total	No. of taxa	Diversity	No./m^2
Upper	Ind	2	1											1	1	0	10
	Mid	2	27	6	2								3	38	4	1.28	376
	Ky	2	75		21									96	2	.72	928
Middle	Ind	2	1	11	36	1	2	20	9	2				82	8	1.98	793
	Mid	2	18	7	23								1	49	4	1.56	474
	Ky	2	36											36	1	0	348
Lower	Ind	2	95	15	34						1			145	4	1.28	1402
	Mid	2	154	3	33							1	1	192	5	.86	1857
	Ky	2	4								4			8	2	1.00	77

Source: University of Louisville, 1975b

APPENDIX Q

Table 11

NUMBERS OF VARIOUS ORGANISMS IN PONAR BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM THE OHIO RIVER, 22 AND 25 NOVEMBER 1975

			TAXONOMIC GROUPS															
			Ephem.	Plecop.	Tricop.		Diptera											
Transect	Station	Number of samples	*Stenonema*	Perlodidae (*Isogenus*)	*Cheumatopsyche*	Adult Trichoptera	Chironomidae	*Bressia*	*Coribicula*	*Quadrula nodulara*	Tubifex	Oligochaeta	Hirudinea	Amphipoda	No. of taxa	Total	Diversity	No./square meter
Upper	Ind	2		1			31	1	92	1	1	271	1		8	399	1.26	3858
	Mid	2					22	2	330						3	354	.39	3423
	Ky	2	1		1				31			8			4	41	1.03	396
Middle	Ind	1										1			1	1	0	19
	Mid	2					4	5	100			2			4	111	.61	1073
	Ky	2					20		36			3			3	59	1.18	571
Lower	Ind	2					17		77			91			3	185	1.35	1789
	Mid	2					4		154						2	158	.17	1528
	Ky	2				1	109		29			15		1	5	145	1.23	1402

Source. University of Louisville, 1975b

APPENDIX Q

Table 12

NAIADS FROM THE OHIO RIVER COLLECTED IN AUGUST AND SEPTEMBER 1975

	Indiana Side all 3 transects	Kentucky Side Lower Transect
Megalonaias gigantea Washboard	x	
Proptera alata Pink heel-splitter	x	x
Amblema peruviana Blue-point	x	x
Amblema costata Three-ridge	x	
Quadrula nodulata Warty back	x	
Quadrula quadrula Maple leaf	x	
Tritogonia verrucosa Buckhorn	x	
Pleurobema cordatum	x	
Corbicula manillensis Asiatic clam	found in great abundance all along Kentucky side and mid river, and moderately abundant all along Indiana side.	

No native mussels were found near the Kentucky side except at the lower transect, where *Proptera alata* and *Amblema peruviana* were collected. Dense native mussel beds were located all along the Indiana side in water 3-5 m deep and 15-30 m from the shoreline (low water level). Greatest density was found in the areas of the mid and lower transects.

Mussels were collected using SCUBA equipment by L. Haag, D. Steele, E. Mancini, S. Elbert, C. Leuthart, H. Spencer, and D. Jennings.

Source: University of Louisville, 1975a

APPENDIX Q

Table 13

NUMBERS OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM CORN CREEK AND BAREBONE CREEK, 9 APRIL 1975

Organisms	Corn Creek Stations						Total	Barebone Creek Stations				Total	Grand Total
	1	1	2	2	3	3		5	5	6	6		
Stenelmis	1	8	6	58	4	1	78	166	185	5	8	364	442
Psephenus	3	8	1	3			15	8	35	1	1	45	60
Dubiraphia				1			1						1
Ectopario	1	1					2						2
Hydrophilidae	1					1	2						2
Haliplidae						1	1						1
Caenis	9	35	16	2	3	11	76	32	49	3	4	88	164
Pseudocleon		13					13						13
Paraleptophlebia	2	9	1	1			13		10	2		12	25
Stenonema		2	29	18	1	7	57	24	20			44	101
Neocleon	4	9					13				26	26	39
Baetinae			69	60	1	5	135	81	59	5		145	280
Unid. Ephemeroptera								6				6	6
Nemoura	1	65	1	1			68	5	25			30	98
Isoperla		9	2	2			13	12	61	4	3	80	93
Unid. Plecoptera	2						2	4				4	6
Cheumatopsyche	1	6	1	1		1	10	7	24			31	41
Rhyacophila	1	16					17	2				2	19
Hydropsyche								2				2	2
Chimarra									1			1	1
Hydroptila									30			30	30
Polycentropus									3			3	3
Chironomidae	72	390	250	151	55	90	1,008	137	473	176	180	966	1,974
Empidae	14	31		1			46	9	19			28	74
Tipulidae		2	6	9			17	1				1	18
Tabanidae		1					1	1	1			2	3
Gammarus	2	4	1	2			9						9
Lirceus	37	135	4	1		2	179	4	6	46	91	147	326
Oligochaeta	58		29	26	2	7	122		15	2	2	19	141
Decopoda		1					1	1				1	2

APPENDIX Q

Table 13 (Continued)

Organisms	Corn Creek Stations							Barebone Creek Stations					Grand
	1	1	2	2	3	3	Total	5	5	6	6	Total	Total
Physa		1					1						1
Nematoda		37				1	38	3				3	41
Goniobasis						1	1	5				5	6
Hydracarina	1						1						1
Sphaerium						6	6						6
Platyhelminthes									1			1	1
Total Number of Organisms	209	784	416	337	66	134	1,946	510	1,017	244	315	2,086	4,032
Number of Taxa	15	22	14	16	6	13	30	18	18	9	8	28	35
Diversity Index	2.351	2.523	1.894	2.289	.864	1.732		2.604	2.648	1.269	1.568		
Number of Organisms per m^2	5148.7[a]		4051.1[a]		1076.0[a]		3489.5[a]	8215.3[a]		3007.4[a]		5611.3	4338.4

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[a] Combined figure for the two samples at this station.

Source: University of Louisville, 1975a.

APPENDIX Q

Table 14

NUMBERS OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES[a], DIVERSITY, AND DENSITY FROM STATIONS 1, 2, 3, 4, 6, AND 7, TRIMBLE COUNTY PLANT SITE, 22 APRIL 1975

Stream	Station	*Stenelmis*	*Psephenus*	*Hydroporus*	*Caenis*	*Pseudocloeon*	*Paraleptophlebia*	*Stenonema*	*Baetis*	*Isoperla*	*Nemoura*	*Perlesta*	*Leuctra*	*Rhyacophila*	*Cheumatopsyche*	*Chimarra*	*Hydroptila*	*Hydropsyche*	Chironomidae	Empidae	Tipulidae	Simuliidae	Ceratopogonidae	Tabanidae	Cecidomyiidae	*Chaoborus*	Gammaridae	*Lirceus*	Turbellaria	Hirudinea	*Oreonectes*	Oligochaeta	*Goniobasis*	Nematoda	*Corbicula*	*Physa*	Total	No. of Taxa	Diversity	Number per square meter
Corn Creek	1	3	3		4	4	3	1	5	2	3			6	1				235	1							1	28	2	1	1						299	18	1.35	2151.0
	1	1	1		2	1		2	5	1	7			3	2				56	3	2						1	12				2					101	16	2.22	
	2	46	3		30	1	4	31	172	1	2	6		1	1				1437	3	9	3	2					33	4				2	1			1794	21	1.22	11712.3
	2	6	1		14		1	5	17	1									286	1	3		1					21	1				2	23			383	15	1.48	
	3	6	2		3	1			8	2					1				75		3							1				8		1			111	12	1.69	2458.7
	3	20	1		6			2	3	2									304													6	1	1			346	10	0.77	
	Tot	82	11		59	9	8	41	210	9	12	6		10	5				2393	8	17	3	3				2	90	7	1	1	16	5	26			3034			
Barebone Creek	5	109	56		9	92	7	36	80	60	70	2	1	5	35	27	28		454	42		8		3			1	28			1	12	20		1		1187	25	3.27	11728.4
	5	332	144		6	74	5	48	120	51	28			2	12	8	5		111	12		5					1	4	1			1	20		1	1	993	24	3.04	
	6	5		3	4			6		2									472					1			3	230	1				1	3		1	752	13	1.23	870[illegible].8
	6	7		9	2		1	20		1									400						7		7	410				1				1	866	12	1.42	
	Tot	453	200	12	21	166	13	110	200	114	98	2	1	7	47	35	33		1437	54		13		4	7		12	692	2		1	14	41	3	2	3	3798			
Oxbow	7																		1							4						439								
	7																		1	5												150								
	Tot																		2	5						4						589								

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[a] Number per square meter. One figure given in last column for combined samples for each station.

Source: University of Louisville, 1975a

APPENDIX Q

Table 15

NUMBERS OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM STATIONS 1, 2, 5, TRIMBLE COUNTY PLANT SITE, 8 MAY 1975

Stream	Station	*Stenelmis*	*Psephenus*	*Caenis*	*Pseudocleon*	*Paraleptophlebia*	*Stenonema*	*Baetis*	*Nemoura*	*Isoperla*	*Perlesta*	*Leuctra*	Perlidae	*Cheumatopsyche*	*Rhyacophila*	*Hydroptila*	*Chimarra*	Chironomidae	Empidae	Tipulidae	Tabanidae	*Simulium*	Ceratopogonidae	Dolichopodidae	*Gammarus*	*Lirceus*	Oligochaeta	*Orconectes*	Nematoda	*Turbellaria*	*Goniobasis*	Total			
Corn Creek	1		2				7	10	1					1				9							2	1		1				34	9	2.15	392.70
	1	1	1			1	4	3			1							20							1	5		2				39	10	1.99	
	2	5	2	4	4		2	6			1							6				1	1									32	10	2.52	532.60
	2	2		10	4	9	10	8		1			1					15							2	4	1					67	12	2.77	
	Tot	8	5	14	8	10	23	27	1	1	2		1	1				50				1	1		5	10	1	3				172	20		462.70
Barebone Creek	5	199	88	20	2	42	46	136	1	6	6			1	1	12		74	4		1		2			10			9	1		66	20	2.90	6068.60
	5	106	70	8	17	3	16	79	3	7	12	5		13		53	10	34	3	1	5	1		1		9	2				9	467	23	3.35	
	Tot	305	158	28	19	45	62	215	4	13	18	5		14	1	65	10	108	7	1	6	1	2	1		19	2		9	1	9	1128	27		6068.60
Grand Tot		313	163	42	27	55	85	242	5	14	20	5	1	15	1	65	10	158	7	1	6	2	3	1	5	29	3	3	9	1	9	1300			2331.33

Source: University of Louisville, 1975a

APPENDIX Q

Table 16

NUMBERS OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM STATIONS 1, 2, 3, AND 5, TRIMBLE COUNTY PLANT SITE, 22 MAY 1975

Stream	Station	*Stenelmis*	*Psephenus*	*Dubiraphia*	*Caenis*	*Pseudocloeon*	*Paraleptophlebia*	*Stenonema*	*Baetis*	*Nemoura*	*Isoperla*	*Perlesta*	*Leuctra*	*Acroneuria*	*Cheumatopsyche*	*Hydroptila*	*Chimarra*	*Rhyacophila*	*Pycnopsyche*	Chironomidae	Tipulidae	Tabanidae	*Simulium*	Ceratopogonidae	Empidae	*Amphiagrion*	*Lirceus*	*Gammarus*	*Turbellaria*	*Hirudinia*	*Orconectes*	*Goniobasis*	Planorbidae	Oligochaeta	Copepoda	Nematoda	*Sphaerium*	Hydracarina	Total	Number of Taxa	Diversity	Number per square meter
Corn Creek	1	4	2		9		4	5	10			5								400							4	3	1	13	23								483	13	1.14	5482.2
	1	4	2			6		10	10	3		22			24					451								4											536	10	[illegible]	
	2	6			19	15		13	4			8		1	21					1367	1						2	2				1							1460	13	0.51	14181.7
	2	7			47	8	3	5	15		1				5					1069		1	1	1			3	1					1	5	1	2			1176	18	0.67	
	3	38		1	22	127	5	25	35		10	2			2	3				416			2			1	12	1						10					712	17	2.07	[illegible]
	3	5			14	2		2	3			4								732				1			2							47		1			813	11	0.65	
	Tot	64	4	1	111	158	12	60	77	3	11	41		1	52	3				4435	1	1	3	2		1	23	11	1	13	23	1	1	62	1	3			5180	30		[illegible]
Barebone Creek	5	465	23		1	1		4	61			47	1		88	7	3			135		1	37	2	1		2		3	4	1	105		41			5	2	1040	24	2.70	[illegible]
	5	164	17			3		11	109			6			5	1	1	1	4	114			2	3	1		5	2			1	66		8			3		527	21	2.65	
	Tot	629	40		1	4		15	170			53	1		93	8	4	1	4	249		1	39	5	2		7	2	3	4	2	171		49			8	2	1567	27		[illegible]
Grand Tot		693	44	1	112	162	12	75	247	3	11	94	1	1	145	11	4	1	4	4684	1	2	42	7	2	1	30	13	4	17	25	172	1	111	1	3	8	2	6747	37		[illegible]

Source: University of Louisville, 1975a

APPENDIX Q

Table 17

NUMBERS OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM STATIONS 1, 2, 3, AND 5, TRIMBLE COUNTY PLANT SITE, 3 JUNE 1975

Stream	Station	*Stenelmis*	*Psephenus*	*Hydroporus*	Dytiscidae	*Stenonema*	*Baetis*	*Pseudocloeon*	*Caenis*	*Paraleptophlebia*	*Perlesta*	*Nemoura*	*Acroneuria*	*Isoperla*	*Cheumatopsyche*	*Hydropsyche*	*Hydroptila*	*Chimarra*	*Pycnopsyche*	Chironomidae	Tipulidae	Ceratopogonidae	Simuliidae	Tabanidae	Empidae	*Lirceus*	*Gammarus*	Hydracarina	Oligochaeta	Nematoda	*Goniobasis*	*Physa*	Turbellaria	*Orconectes*	*Corbicula*	*Sphaerium*	Total	No. of Taxa	Diversity	No. per square meter
Corn Creek	1	19	1			44	68				2									114						1											249	7	1.81	7591
	1	9				1	19	90	1	2	3	1	10		75	11				935						1	1	3									1162	15	1.14	
	2	18	2	2		4	8	4	13						12		1			917	6	1				4			4								996	14	0.63	8704
	2	16	1			12	38	1	2		3				2		1			527	5	1							7	2	2	2					622	16	1.00	
	3	45			4	10	27	1	22		3			1	1					1719		2				1	1		1				2	2			1842	16	0.51	14111
	3	72	4			30	42	18	5		18				1					582	1	2	2			1			1				2				781	15	1.45	
	Tot	179	8	2	4	101	202	114	43	2	29	1	10	1	91	11	2			4794	12	6	2			8	2	3	13	2	2	2	4	2			5652			
Barebone Creek	5	627	40	1						2	19				264		5	4		410			2	7		10		1	16		5		3	1		6	1423	18	2.33	17449
	5	135	32			1			4		6				25				1	77				2	2	1			20		13		4	2	2		327	16	2.47	
	Tot	762	72	1		1			4	2	25				289		5	4	1	487			2	9	2	11		1	36		18		7	3	2	6	1750			
Grand Tot		941	80	3	4	102	202	114	47	4	54	1	10	1	380	11	7	4	1	5281	12	6	4	9	2	19	2	4	49	2	20	2	11	5	2	6	7402			

Source: University of Louisville, 1975a

APPENDIX Q

Table 18

NUMBER OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM CORN CREEK AND BAREBONE CREEK, 18 JUNE 1975, STATIONS 1, 2, 3, AND 5, TRIMBLE COUNTY PLANT SITE

Stream	Station	*Stenelmis*	*Psephenus*	Gyrinidae	*Pseudocloeon*	*Stenonema*	*Baetis*	*Caenis*	*Acroneuria*	*Perlesta*	*Hydropsyche*	*Cheumatopsyche*	*Chimarra*	*Pycnopsyche*	Chironomidae	Empidae	Tipulidae	Simuliidae	Tabanidae	Gammaridae	*Lirceus*	Turbellaria	*Nigronia*	*Orconectes*	Oligochaeta	*Goniobasis*	*Branchiura*	*Physa*	*Corbicula*	*Sphaerium*	Total	Number of Taxa	Diversity	Number/m^2
Corn Creek	1	10	2		6	22	55	8	3		1	85			66	1	1	19		2	2			1	1						285	17	2.67	1533.3
	2	9			8	1	15	1		1		27	1		164	3	3	1					2		2	36					274	15	1.98	1474.1
	3	27	2	2	1	6	24	3		5		22			181	1		7			2	1	2		8		1				295	17	2.07	1587.1
	Tot	46	4	2	15	29	94	12	3	6	1	134	1		411	5	4	27		2	4	1	4	1	11	36	1				854			
Barebone Creek	5	761	49			1	3			38		278	17	2	44	6	3		3		25	22			21	93		1	1	9	1377	19	2.18	7408.3
	Tot	761	49			1	3			38		278	17	2	44	6	3		3		25	22			21	93		1	1	9	1377			
Grand Tot		807	53	2	15	30	97	12	3	44	1	412	18	2	455	11	7	27	3	2	29	23	4	1	32	129	1	1	1	9	2231			

Source: University of Louisville, 1975a

APPENDIX Q

Table 19

NUMBER OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM CORN CREEK AND BAREBONE CREEK, 2 JULY 1975, STATIONS 1, 2, 3, AND 5, TRIMBLE COUNTY PLANT SITE

Stream	Station	*Stenelmis*	*Psephenus*	Dytiscidae	*Stenonema*	*Baetis*	*Caenis*	*Acroneuria*	*Perlesta*	*Neoperla*	*Cheumatopsyche*	*Hydroptila*	*Hydropsyche*	*Chimarra*	Chironomidae	Tipulidae	Empididae	Simuliidae	Ceratopogonidae	*Sialis*	*Nigronia*	*Orconectes*	*Lirceus*	*Gammarus*	Hirudinea	*Corbicula*	*Goniobasis*	*Branchiura*	Oligochaetes	Turbellaria	*Anodonta*	*Sphaerium*	Total	Number of Taxa	Diversity	Number/m^2
Corn Creek	1	3	2		2	6				1	8				24	1				2	2	4	1	7	4								67	14	2.72	360
	2	38	5		6	67	1				16	1			193	5				1	1	3	3	2	1	1	3	5	16				368	19	2.25	1980
	3	35	2			58			1		103	4	3	1	154			11	1	1	4						1	1	2	1			383	17	2.25	2061
	Tot	76	9		8	131	1		1	1	127	5	3	1	371	6		11	1	4	7	7	4	9	5	1	4	6	18	1			818			
Barebone Creek	5	260	15	2	1	11		1	1	6	113		4	52	40		4	3			1	2	3				9		4	1	1	5	539	22	2.38	2900
	Tot	260	15	2	1	11		1	1	6	113		4	52	40		4	3			1	2	3				9		4	1	1	5	539			
Grand Tot		336	24	2	9	142	1	1	2	7	240	5	7	53	411	6	4	14	1	4	8	9	7	9	5	1	13	6	22	2	1	5	1357			

Source: University of Louisville, 1975a

APPENDIX Q

Table 20

NUMBERS OF ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM CORN CREEK AND BAREBONE CREEK, TRIMBLE COUNTY PLANT SITE, 22 JULY 1975

Stream	Station	*Stenelmis*	*Psephenus*	*Caenis*	*Stenonema*	*Baetis*	*Pseudocloeon*	*Paraleptophlebia*	*Ephemera*	*Acroneuria*	*Neoperla*	*Cheumatopsyche*	*Chimarra*	*Polycentropus*	Chironomidae	Tabanidae	Tipulidae	Empidae	*Nigronia*	*Sialis*	Oligochaeta	*Orconectes*	*Goniobasis*	Nematoda	Turbellaria	*Branchiura*	*Lirceus*	*Gammarus*	*Sphaerium*	TOTAL	No. of Taxa	Diversity	Number/m²
Corn Creek	1	1		5	1	1	3	1		1		4			12						1									31	10	2.16	403.5
	1	3		9	3	3						1			24	1			1											45	8	1.80	
	2	12	4	31	22	20				1		29	2	2	105		1	2	2		1	3	2	1						240	17	2.54	2447.9
	2	12	3	13	15	57			1	1		39			65	1	2	1	2			3								215	17	2.52	
	3	40		30		17						70			327		1				9	1	3		4	1				503	11	1.70	4138.7
	3	27	1	53		3						23			145					1	5	1	4		4	2	1			270	13	2.00	
	Tot	95	8	141	41	101	3	1	1	3		166	2	2	678	2	4	3	5	1	16	8	9	1	8	3	1			1303			
Barebone Creek	5	92	4		1	2						22	7									2	5					1	1	137	10	1.55	2318.8
	5	157	21		2	2					1	60	20		9		1				1	1	14		2		2		1	294	15	2.08	
	Tot	249	25		3	4					1	82	27		9		1				1	3	19		2		2	1	2	431			
Gr. tot		344	33	141	44	105	3	1	1	3	1	248	29	2	687	2	5	3	5	1	17	11	28	1	10	3	3	1	2	1734			

Source: University of Louisville, 1975a

APPENDIX Q

Table 21

NUMBERS OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM STATIONS 1, 2, 3, 4, 5, AND 7, TRIMBLE COUNTY PLANT SITE, 11 AUGUST 1975

Stream	Station	*Stenelmis*	*Psephenus*	*Berosus*	*Dubiraphia*	*Stenonema*	Baetinae	*Campsurus*	*Caenis*	*Isonychia*	*Acroneuria*	Unident. Trichoptera	*Agraylea*	*Cheumatopsyche*	*Chimarra obscura*	*Hydropsyche*	Chironomidae	Ceratopogonidae	Unident. Diptera	Empididae	*Bezzia*	Simuliidae	Tipulidae	*Corydalus*	Hemiptera	*Hagenius*	Oligochaeta	*Goniobasis*	*Orconectes*	Isopoda	*Physa*	Cladocera	*Helisoma*	*Corbicula*	*Dugesia*	Amphipoda	*Planaria*	Hydracarina	*Chaoborus*	Total	No. of Taxa	Diversity	No./m²
Corn Creek	1	10	15			15	3					9	1				184	1	4					3	5		3	2												255	13	1.612	1,549
	1	1	9			2		2						1	1		15			1									1											33	9	1.878	
	2	4	12				21		4			3		344	4	3	51			2								2		1										451	12	1.305	11,578
	2	17	23	1		8	78		3	1	1	24		861	31		611			2						14	6	16	2		1	1								1701	19	1.801	
	3	7							1			2		7			270										186	82	1		8	1		1	68					634	12	2.032	20,126
	3	17			2				36					6			1870				30				1		1099	24		1	20	2	1							3107	13	1.280	
	4																304										384												16	704	3	1.112	6,808
	Tot	56	59	1	2	25	102	2	42	1	1	38	1	1219	36	3	3305	1	4	5	30			3	6	14	1687	126	4	2	29	4	1	1	68				16	6885			
Barebone Creek	5	4	22			2	11							9	17		14			1		7	1				2		1	1				6		2	3	1		104	17	3.088	2,222
	5	28	36			1	7					2		34	76	1	93			6		8					4	5	3	3							2			309	16	2.744	
	Tot.	32	58			3	18					2		43	93	1	107			7		15	1				6	5	4	4				6		2	5	1		413			
Oxbow	7																9										1553												1562		2	.049	13,446

Source: University of Louisville, 1975a

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APPENDIX Q

Table 22

NUMBERS OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM STATIONS 1, 2, 3, AND 5, TRIMBLE COUNTY PLANT SITE, 23 SEPTEMBER 1975

	Station	*Psephenus*	Hydrophilidae	Dytiscidae	*Stenelmis*	*Dubiraphia*	Baetinae	*Stenonema*	*Caenis*	*Paraleptophlebia*	*Isonychia*	*Agraylea*	*Hydroptila*	*Cheumatopsyche*	*Chimarra obscura*	Psychomyiidae	Chironomidae	Empidae	Tipulidae	Ceratopogonidae	*Physa*	*Lerotus*	Oligochaeta	Odonata	*Corydalus*	Veliidae	*Goniobasis*	*Acroneuria*	Cladocera	Tricladia	Amphipoda	Orconectes	*Sphaerium*	*Corbicula*	Total	# of taxa	Diversity	#/m2
Corn Creek	1	6	9	1	3		1	2				3	1				166	2			27	2	5												228	13	1.47	1,7
	1	12	3		2		4	1				1	1				41		1		25		2												93	11	2.07	
	2	95	2		17		30	57	10	2				326	14		441		3	2	4		5	2	3	1	15								1,029	18	2.23	1437
	2	94	3		23		64	24	2		6			923	98	1	361	2	3		1	1	5	4	1		26								1,642	19	2.01	
	3*	8	2		7	1	1	1						22	6		74		1		34	1	392	1		3	25		4	187					770	18	2.12	4,14
Barebone Creek	5	40			109		18	7						17	27		21		2				18			1	9			2	8	2	6		287	15	2.86	1,8
	5	21	1		3		9	7						7	3		4				1	1	1				2			2	2			1	65	15	2.78	

* 2 square-foot samples combined

Source: University of Louisville, 1975a

APPENDIX Q

Table 24

NUMBERS OF ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY
FROM CORN CREEK AND BAREBONE CREEK, TRIMBLE COUNTY PLANT SITE
14 NOVEMBER 1975

Group	Species	Corn Creek						Barebone Creek	
		Station							
		1	1	2	2	3	3	5	5
Coleoptera	*Psephenus* sp.	2	8	2	14	1	4	21	60
	Stenelmis sp.		2		5	8	7	30	110
	Dubiraphia sp.			1					
	Hydrophilidae	2	4		1		1		
Diptera	Chironomidae larvae	66	426	95	193	30	31	14	158
	Chironomidae pupae	1	10	5	9	2	3		
	Empidae		1					1	1
	Tipulidae		1		4	1			12
	Tabanidae			1	1				
	Simulidae					1		1	1
	Ceratopogonidae								1
Ephemeroptera	*Stenonema* sp.	7	52	1	8	2		1	1
	Caenis sp.	1	7	3	6		2		
	Baetinae	1	16	4	3	3		4	3
Trichoptera	*Chimarra* sp.		6		2			8	50
	Cheumatopsyche sp.		2		1	2			
	Hydropsyche sp.					1	3	4	20
Plecoptera	*Isoperla* sp.	6	3						7
	Allocapnia sp.	6							
	Leuctra sp.		1						
	Capnidae		3						
	Unid. Plecoptera				1	1	1		
Megaloptera	*Nigronia* sp.		1						
Gastropoda	*Heliosoma* sp.					1			
	Goniobasis sp.			3	11		12		2
	Physa sp.	3	17	3	2	3		1	
	Ferrissia sp.	1			1				

APPENDIX Q

Table 23

NUMBERS OF VARIOUS ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM STATIONS 1, 2, 3, 4, AND 5, TRIMBLE COUNTY PLANT SITE, 9 OCTOBER 1975

	Station	*Psephenus*	*Stenelmis*	*Dubiraphia*	Hydrophilidae	*Caenis*	*Stenonema*	Baetinae	*Paraleptophlebia*	*Cheumatopsyche*	*Chimarra obscura*	*Hydropsyche*	*Agraylea*	Chironomidae	Tabanidae	Simuliidae	*Goniobasis*	*Physa*	*Planorbis*	*Lercius*	Oligochaeta	*Ferrissia*	*Corbicula*	*Corydalus*	Veliidae	Tricladia	*Gammarus*	*Sialis*	Odonata	Total	# of taxa	Diversity	#/m²
Corn Creek	1	7	4			4	11	1						11			8			2										48	8	2.39	436
	1	13	9			2	5			3	1																			33	6	1.85	
	2	13	7	2	2		3	4						14			55			1	3									104	10	2.07	2,362
	2	73	11	5	4	57	6	1		47	4	3	3	18	6		54	23	1	3	10	1	1	2	1				1	335	23	3.21	
	3	9	12		5	2	1	4		4	1			8			37	8		1	88		6			7			1	194	16	2.54	1,496
	3	4	12				3	1			1			1			1			1	52					6	1	1		84	12	1.78	
	4		3	1		1	10			3				4						1	3		2							28	9	2.24	533
	4	1	4	2		1	30		4					7							20		2							71	9	2.06	
Barebone Creek	*5	90	121	1			3	5		154	203			35		4	66			11	5		15			22	1			736	15	2.80	3,960

* 2 square-foot samples combined

Source: University of Louisville, 1975a

Table 24 (Continued)

Group	Species	Corn Creek						Barebone Creek	
		Station							
		1	1	2	2	3	3	5	5
Pelecypoda	*Sphaerium* sp.							2	7
	Corbicula sp.		1		1		1		
Decapoda	*Orconectes* sp.						1	1	
Isopoda	*Lirceus* sp.	34	19						2
	Asellus sp.				2	1			
	Isopoda								
Amphipoda	Amphipoda			1	1				2
Annelida	Hirudinea	1							
	Turbellaria					6	55	4	27
	Oligochaeta		1	16	38	46	27	4	16
	Annelida		3						
	Total Individuals	131	584	135	304	109	148	96	480
	Total Taxa	12	20	11	19	15	12	14	18
	Diversity (H)	1.98	1.55	1.36	1.85	2.24	2.33	2.65	2.75
	Number per meter^2	1410	6286	1453	3272	1173	1593	1033	5166

Source: University of Louisville, 1975b

APPENDIX Q

Table 25

NUMBERS OF ORGANISMS IN SQUARE-FOOT BENTHIC SAMPLES, DIVERSITY, AND DENSITY FROM CORN CREEK AND BAREBONE CREEK, TRIMBLE COUNTY PLANT SITE
5 DECEMBER 1975

Stream	Station	*Stenelmis*	*Psephenus*	Hydrophilidae	*Dubiraphia*	*Stenonema*	Baetinae	*Caenis*	*Allocapnia*	*Cheumatopsyche*	*Cyrnellus fraternus*	*Chimarra obscura*	Chironomidae	Tipulidae	*Bressia*	Empidae	Tabanidae	Simuliidae	*Larvius*	Oligochaeta	*Physa*	*Goniobasis*	*Helisoma*	Planariidae	*Sphaerium*	*Lampsilis*	Nematoda	*Ferissia*	*Branchiura*	*Orconectes*	*Nigronia*	*Sialis*	*Corbicula*	Total	# of taxa	Diversity	Number/m²
Corn Creek	1	2				10	1		2				12						1	10														38	7	2.26	409
	1		2	1		7	3	5	2	1			90	1					3	1	8	1												125	13	1.74	1345
	2	34	34	1.	1		4	3	1				384	12	2					30	2	2	1	1	4	1	2							519	18	1.58	5384
	2	11	34	4				1		2			479	11		2				26				1	5			1						577	12	1.10	6209
	3		5			1	3	1	1				64	1	1				6	.49	3			2					11			1		149	14	2.28	1603
	3					5	8			2	1		95						2	38	4			6	4				22	1	1			109	13	2.31	2034
Barebone Creek	5*	68	57		2	6	34	5	24	53		186	751	2	1		1	2		74		26		47	8								1	1348	19	2.38	7252

* two square foot samples combined

Source: University of Louisville, 1975b

Table 26

LIST OF INVERTEBRATES TAKEN FROM NORTH CREEK (RA) AND SOUTH CREEK (RB), TRIMBLE COUNTY GENERATING PLANT, FEBRUARY (F), MARCH (M), AND APRIL (A), 1976

	North Creek		South Creek	
Platyhelminthes	Turbellaria	M,A	Turbellaria	F,A
Annelida	Oligochaeta	F,M,A	Oligochaeta	F,M,A
Crustacea	*Lirceus* sp.	F,M,A	*Lirceus* sp.	F,M,A
	Gammarus sp.	F,A	*Gammarus* sp.	F,M
			Asellus sp.	M
Ephemeroptera	*Stenonema* sp.	F	*Stenonema* sp.	A
	Caenis sp.	F	Baetinae	M
	Baetinae	M	*Baetis* sp.	F,M
	Baetis sp.	A	*Pseudocloeon* sp.	M
			Paraleptophlebia sp.	M,A
Plecoptera	*Isogenus* sp.	F,A	*Isogenus* sp.	F,M,A
	Nemoura sp.	M,A	*Nemoura* sp.	F,M,A
Trichoptera	*Chimarra obscura*	F,A	*Neophylax* sp.	F,M,A
	Neophylax sp.	F,M,A		
	Hydroptilidae	A		
	Rhyacophila	A		
Diptera	Chironomidae	F,M,A	Chironomidae	F,M,A
	Tipula abdominalis	F,M,A	Tabanidae	A
	Empidae	M,A	Simulidae	F
	Tabanidae	M		
	Simulidae	A		
Coleoptera	*Psephenus herricki*	F	*Psephenus herricki*	F,M,A
	Elmini	F,A	Elmini	M,A
	Hydrophilidae (*Berosus*?)	M		
Other	Collembola	F		
	Sphaeridae	A		

APPENDIX R

KINDS AND WEIGHTS OF FISHES TAKEN IN 62 COLLECTIONS BY THE UNIVERSITY OF LOUISVILLE (1957-1959) AND IN 6 COLLECTIONS BY THE ENVIRONMENTAL PROTECTION AGENCY (1968-1970) FROM THE OHIO RIVER IN THE VICINITY OF THE TRIMBLE COUNTY GENERATING PLANT SITE

Common Name	Scientific Name	University of Louisville		EPA		Total	
		Number	Weight	Number	Weight	Number	Weight
Paddlefish	*Polyodon spathula*	27	46.66	1	5.10	28	51.76
Spotted gar	*Lepisosteus oculatus*	1	0.85			1	0.85
Longnose gar	*Lepisosteus osseus*	33	18.82	32	38.29	65	57.11
Shortnose gar	*Lepisosteus platostomus*	7	0.69			7	0.69
American eel	*Anguilla rostrata*	2	0.47	94	14.41	96	14.87
Skipjack herring	*Alosa chrysochloris*	1,845	722.56	632	17.96	2,477	740.52
Gizzard shad	*Dorosoma cepedianum*	24,240	2,650.81	9,544	1,342.53	33,784	3,975.34
Threadfin shad	*Dorosoma petenense*	52	2.24	3	0.15	55	2.39
Goldeye	*Hiodon alosoides*	100	26.78	3	2.40	103	29.18
Mooneye	*Hiodon tergisus*	16	2.08			16	2.08
Stoneroller	*Campostoma anomalum*	4	0.11			4	0.11
Goldfish	*Carassius auratus*	13	19.31	16	13.30	29	32.61
Carp	*Cyprinus carpio*	486	366.91	565	1,582.18	1,051	1,949.09
Silverjaw minnow	*Ericymba buccata*	3	0.01			3	0.01
Silvery minnow	*Hybognathus nuchalis*	7	0.02			7	0.02
Speckled chub	*Hybopsis aestivalis*	62	0.12			62	0.12
Silver chub	*Hybopsis storeriana*	5,890	87.25	37	0.12	5,927	87.37
Golden shiner	*Notemigonus crysoleucas*	1	0.04			1	0.04
Emerald shiner	*Notropis atherinoides*	45,085	206.83	385	0.73	45,470	207.56
River shiner	*Notropis blennius*	127	0.47			127	0.47
Ghost shiner	*Notropis buchanani*	324	0.52			324	0.52
Common shiner	*Notropis cornutus*	13	0.22			13	0.22
Silverband shiner	*Notropis shumardi*	2	0.01			2	0.01
Spotfin shiner	*Notropis spilopterus*	3	0.02			3	0.02
Sand shiner	*Notropis stramineus*	3	0.01			3	0.01

APPENDIX R (Continued)

Common Name	Scientific Name	University of Louisville Number	University of Louisville Weight	EPA Number	EPA Weight	Total Number	Total Weight
Mimic shiner	Notropis volucellus	831	2.11			831	2.11
Steelcolor shiner	Notropis whipplei	2	0.02			2	0.02
Suckermouth minnow	Phenacobius mirabilis	1	0.02			1	0.02
Bluntnose minnow	Pimephales notatus	202	0.51			202	0.51
Fathead minnow	Pimephales promelas	1	0.01			1	0.01
Creek chub	Semotilus atromaculatus	8	0.09			8	0.09
River carpsucker	Carpiodes carpio	73	19.43	24	25.71	97	45.14
Quillback	Carpiodes cyprinus	19	5.00			19	5.00
Highfin carpsucker	Carpiodes velifer			2	1.80	2	1.80
White sucker	Catostomus commersoni	20	7.88			20	7.88
Northern hog sucker	Hypentelium nigricans	7	1.23			7	1.23
Smallmouth buffalo	Ictiobus bubalus	92	35.89	25	46.25	117	82.14
Bigmouth buffalo	Ictiobus cyprinellus	2	6.83	27	90.80	29	97.63
Spotted sucker	Minytrema melanops	382	148.69	3	2.90	385	151.59
River redhorse	Moxostoma carinatum	27	13.41			27	13.41
Golden redhorse	Moxostoma erythrurum	30	13.52			30	13.52
Shorthead redhorse	Moxostoma macrolepidotum	1	0.03			1	0.03
Blue catfish	Ictalurus furcatus	545	62.51	1	0.01	546	62.52
Black bullhead	Ictalurus melas	58	13.69	4	0.02	62	13.71
Yellow bullhead	Ictalurus natalis	12	1.11	6	0.10	18	1.21
Brown bullhead	Ictalurus nebulosus	14	2.88			14	2.88
Channel catfish	Ictalurus punctatus	2,388	365.59	827	412.19	3,215	777.78
Tadpole madtom	Noturus gyrinus	127	1.01			127	1.01
Brindled madtom	Noturus miurus	30	0.09			30	0.09
Flathead catfish	Pylodictis olivaris	127	73.72	14	2.32	141	76.40
Trout-perch	Percopsis omiscomaycus	1	0.01			1	0.01
Blackstripe topminnow	Fundulus notatus	1	0.01			1	0.01
White bass	Morone chrysops	43	3.22			43	3.22
Rock bass	Ambloplites rupestris	4	0.20	1	0.20	5	0.40
Green sunfish	Lepomis cyanellus	157	3.24	1	0.09	158	3.33

APPENDIX R (Continued)

Common Name	Scientific Name	University of Louisville Number	University of Louisville Weight	EPA Number	EPA Weight	Total Number	Total Weight
Warmouth	*Lepomis gulosus*	149	7.09			149	7.09
Orangespotted sunfish	*Lepomis humilis*	95	1.25			95	1.25
Bluegill	*Lepomis macrochirus*	663	19.28	60	4.81	723	24.09
Longear sunfish	*Lepomis megalotis*	745	22.08	6	0.16	751	22.24
Redear sunfish	*Lepomis microlophus*	1	0.02	5	0.05	6	0.70
Smallmouth bass	*Micropterus dolomieui*	2	0.17	2	0.12	4	0.29
Spotted bass	*Micropterus punctulatus*	48	4.51	2	0.02	50	4.53
Largemouth bass	*Micropterus salmoides*	72	44.55			72	44.55
White crappie	*Pomoxis annularis*	367	19.33	32	7.34	399	26.67
Black crappie	*Pomoxis nigromaculatus*	61	10.52	4	0.51	65	11.03
Greenside darter	*Etheostoma blennioides*	12	0.04			12	0.04
Rainbow darter	*Etheostoma caeruleum*	17	0.05			17	0.05
Fantail darter	*Etheostoma flabellare*	33	0.12			33	0.12
Stripetail darter	*Etheostoma kennicotti*	13	0.04			13	0.04
Johnny darter	*Etheostoma nigrum*	2	0.01			2	0.01
Yellow perch	*Perca flavescens*	2	0.09			2	0.09
Logperch	*Percina caprodes*	11	0.20			11	0.20
River darter	*Percina shumardi*	1	0.01			1	0.01
Sauger	*Stizostedion canadense*	20	5.75	13	3.16	33	8.91
Walleye	*Stizostedion v. vitreum*			3	0.83	3	0.83
Freshwater drum	*Aplodinotus grunniens*	18,057	481.51	1,034	249.76	19,091	731.27
	Total Number of Fish	103,922	5,551.78	13,406	3,848.34	117,328	9,400.12
	Total Number of Species	74		33		76	

Source: Data provided by the University of Louisville, 1975a. Nomenclature follows American Fisheries Society (1970).

APPENDIX S

FISHES OF INDIANA THAT MIGHT BE PRESENT IN STUDY AREA VICINITY, TRIMBLE COUNTY GENERATING PLANT

Common Name	Scientific Name	Potential Location in Study Area Vicinity
American eel[a]	*Anguilla rostrata*	Ohio River basin
Banded sculpin	*Cottus carolinae*	Ohio River drainages
Bigeye shiner	*Notropis boops*	Ohio River drainages
Black buffalo[a]	*Ictiobus niger*	Ohio River drainages
Black bullhead	*Ictalurus melas*	All major drainages
Black crappie	*Pomoxis nigromaculatus*	All major drainages
Black redhorse	*Moxostoma duquesnei*	Ohio River drainages
Blackside darter	*Percina maculata*	All major drainages
Blackstripe topminnow	*Fundulus notatus*	All major drainages
Bluegill	*Lepomis macrochirus*	All major drainages
Blue sucker*	*Cycleptus elongatus*	Ohio River
Bluntnose minnow	*Pimephales notatus*	All major drainages
Bowfin	*Amia calva*	Ohio River basin
Brindled madtom	*Noturus miurus*	Ohio River drainages
Brook silverside	*Labidesthes sicculus*	All major drainages
Brown bullhead	*Ictalurus nebulosus*	Ohio River drainages
Burbot	*Lota lota*	Ohio River drainages
Carp	*Cyprinus carpio*	All drainages
Central longear sunfish	*Lepomis megalotis megalotis*	Throughout
Channel catfish	*Ictalurus punctatus*	All major drainages
Channel mimic shiner	*Notropis volucellus wickliffi*	Ohio River
Creek chub	*Semotilus atromaculatus*	All major drainages
Eastern sand darter*	*Ammocrypta pellucida*	Ohio River drainages
Emerald shiner	*Notropis atherinoides*	All major drainages
Fantail darter	*Etheostoma flabellare*	All major drainages
Flathead catfish	*Pylodictis olivaris*	Ohio River drainages
Flier	*Centrarchus macropterus*	Ohio River drainages
Freshwater drum	*Aplodinotus grunniens*	Ohio River drainages

APPENDIX S (Continued)

Common Name	Scientific Name	Potential Location in Study Area Vicinity
Gizzard shad	*Dorosoma cepedianum*	Ohio River basin
Golden redhorse	*Moxostoma erythrurum*	All major drainages
Golden shiner	*Notemigonus chrysoleucas*	All major drainages
Goldeye	*Hiodon alosoides*	Ohio River
Grass pickerel	*Esox americanus vermiculatus*	All major basins
Green sunfish	*Lepomis cyanellus*	All major drainages
Greenside darter	*Etheostoma blennioides*	Ohio River drainages
Highfin carpsucker	*Carpiodes velifer*	Ohio River drainages
Hog sucker	*Hypentelium nigricans*	All major drainages
Hornyhead chub[b]	*Nocomis biguttatus*	?
Johnny darter	*Etheostoma nigrum*	All major drainages
Lake sturgeon[b]	*Acipenser fulvescens*	Ohio River basin
Logperch	*Percina caprodes*	All major drainages
Longnose gar	*Lepisosteus osseus*	All major basins
Mooneye	*Hiodon tergisus*	Ohio River
Mountain madtom[b]	*Noturus eleutherus*	Ohio River drainages
Muskellunge	*Esox masquinongy*	Ohio River basin
Northern bigeye chub	*Hybopsis amblops amblops*	All major drainages (except Kankakee River)
Northern bullhead minnow	*Pimephales vigilax perspicuus*	Ohio River drainages
Northern fathead minnow	*Pimephales promelas promelas*	Ohio River drainages
Northern largemouth bass	*Micropterus salmoides salmoides*	All major drainages
Northern mimic shiner	*Notropis volucellus volucellus*	All major drainages
Northern river carpsucker	*Carpiodes carpio carpio*	Ohio River drainages
Northern rock bass	*Ambloplites rupestris rupestris*	All major drainages
Northern spotted bass	*Micropterus punctulatus punctulatus*	Ohio River drainages
Ohio lamprey	*Ichthyomyzon bdellium*	Ohio River basin
Ohio redhorse	*Moxostoma breviceps*	Ohio River

APPENDIX S (Continued)

Common Name	Scientific Name	Potential Location in Study Area Vicinity
Orangespotted sunfish	*Lepomis humilis*	All major drainages
Orangethroat darter	*Etheostoma spectabile spectabile*	All major drainages
Paddlefish	*Polyodon spathula*	Ohio River basin
Pallid shiner[b]	*Notropis amnis*	Ohio River drainages
Pirate perch	*Aphredoderus sayanus*	Ohio River drainages
Pugnose minnow	*Opsopoeodus emiliae*	Ohio River drainages
Quillback	*Carpiodes cyprinus*	Ohio River drainages
Rainbow darter	*Etheostoma caeruleum*	All major drainages
Redear sunfish	*Lepomis microlophus*	Stocked in farm ponds
Redfin shiner	*Notropis umbratilis*	All major drainages
River redhorse[b]	*Moxostoma carinatum*	Ohio River drainages
River shiner[b]	*Notropis blennius*	Ohio River drainages
Rosefin shiner*	*Notropis ardens*	Ohio River drainages
Rosyface shiner	*Notropis rubellus*	All major drainages
Sand shiner	*Notropis stramineus stramineus*	All major drainages
Sauger	*Stizostedion canadense*	Ohio River drainages
Shovelnose sturgeon[b]	*Scaphirhynchus platorynchus*	Ohio River basin
Silver chub	*Hybopsis storeriana*	Ohio River drainages
Silver lamprey[c]	*Ichthyomyzon unicuspis*	Ohio River basin
Silver shiner	*Notropis photogenis*	Ohio River drainages
Silverjaw minnow	*Ericymba buccata*	All major drainages
Silvery minnow	*Hybognathus nuchalis*	Ohio River drainages
Skipjack herring	*Alosa chrysochloris*	Ohio River basin
Slenderhead darter	*Percina phoxocephala*	Ohio River drainages
Smallmouth bass	*Micropterus dolomieui*	All major drainages
Smallmouth buffalo	*Ictiobus bubalus*	Ohio River
Southern redbelly dace	*Phoxinus erythrogaster*	Ohio River drainages
Spotfin shiner	*Notropis spilopterus*	All major drainages
Spotted gar	*Lepisosteus oculatus*	Ohio River basin
Spotted sucker	*Minytrema melanops*	All major drainages
Steelcolor shiner	*Notropis whipplei*	Ohio River drainages
Stonecat	*Noturus flavus*	All major drainages
Stoneroller	*Campostoma anomalum*	All major drainages
Striped shiner	*Notropis chrysocephalus*	All major drainages

APPENDIX S (Continued)

Common Name	Scientific Name	Potential Location in Study Area Vicinity
Suckermouth minnow	*Phenacobius mirabilis*	Ohio River drainages
Tadpole madtom	*Noturus gyrinus*	All major drainages
Threadfin shad	*Dorosoma petenense*	Ohio River basin
Variegated darter[b*]	*Etheostoma variatum*	Ohio drainage
Walleye[b]	*Stizostedion vitreum vitreum*	Ohio River drainages
Western blacknose dace	*Rhinichthys atratulus meleagris*	All major drainages
Western creek chubsucker	*Erimyzon oblongus claviformis*	All major drainages
White bass	*Morone chrysops*	Ohio River drainages
White catfish	*Ictalurus catus*	Introduced; mostly in ponds
White crappie	*Pomoxis annularis*	All major drainages
White sucker	*Catostomus commersonii*	All major drainages
Yellow bullhead	*Ictalurus natalis*	All major drainages

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[a] Presence rare.

[b] Present in only a few localities.

[c] Presence doubtful.

*Endangered or threatened in Indiana (State of Indiana, no date a).

Source: Nelson and Gerking, 1968.

APPENDIX T

DRAFT NPDES PERMIT

DRAFT

FINAL

Permit No. KY0041971
Application No. KY0041971

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et. seq; the "Act"),

Louisville Gas and Electric Company
P. O. Box 32010
Louisville, Kentucky 40232

is authorized to discharge from a facility located at

Trimble County
Units 1, 2, 3 and 4
Trimble County, Kentucky

to receiving waters named Ohio River
from discharge points enumerated herein, as serial numbers 001, 002, 003, 004, 005, 006 and 007

during the effective period of this permit

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

This permit shall become effective on

This permit and the authorization to discharge shall expire at midnight, . Permittee shall not discharge after the above date of expiration without prior authorization. In order to receive authorization to discharge beyond the above date of expiration, the permittee shall submit such information, forms, and fees as are required by the Agency authorized to issue NPDES permits no later than 180 days prior to the above date of expiration.

Signed this day of

Paul J. Traina, Director
Enforcement Division

T-2

DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 001 - Point source(s) runoff from construction

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations	Monitoring Requirements	
	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	N/A	1/week	Grab
Total Suspended Solids (mg/l)	1/	1/week	Grab
Total Settleable Solids (ml/l)	N/A	2/week	Grab
Turbidity (JTU)	N/A	2/week	Grab

1/ Pending repromulgation of effluent guidelines for this waste category, limitations on total suspended solids shall not be applicable. Within 90 days of repromulgation, permittee shall submit a proposed implementation schedule and shall expeditiously complete necessary facilities, if any, to assure compliance with such repromulgated regulations. In the interim, construction practices and control of site runoff shall be consistent with sound engineering practices such as those contained in "Guidelines for Erosion and Sediment Control Planning and Implementation," EPA-R2-72-015 (August, 1972) or "Processes, Procedures and Methods to Control Pollution Resulting from all Construction Activity," EPA-430/9-73-007 (October, 1973). Where an impoundment is utilized by permittee, it shall be capable of containing a 10-year, 24-hour rainfall event.

T-2

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored each time the pond is sampled..

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Discharge from the runoff treatment pond prior to entry into the Ohio River.

DRAFT

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 002 - Cooling tower blowdown

Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Daily Average	Daily Maximum	Measurement Frequency	Sample Type
Flow-m^3/day (MGD)	N/A	N/A	Continuous	Recorder
Temperature °C(°F)	N/A	31.7 (89.0) 1/	Continuous	Recorder
Total Residual Chlorine	See Below		1/week 2/	Multiple Grabs
Additional Monitoring (See Part III.L)	N/A	N/A	1/month	Grab

Total residual chlorine may be discharged continuously but shall not exceed a maximum instantaneous concentration of 0.20 mg/l at any time. Chlorination control practices shall be instituted to minimize discharge of total residual chlorine. A report describing procedures and chlorine usage shall be submitted annually along with the first quarterly monitoring report submitted after January 1st of each year. In the event that the units cannot be operated at or below this level of chlorination, the applicant may submit a demonstration, based on biological toxicity data, that discharge of higher levels of chlorine are consistant with toxicity requirements of the Kentucky Water Quality Standards. Effluent limitations will be modified consistant with an acceptable demonstration.

Discharge of blowdown from the cooling system shall be limited to the minimum discharge of recirculating water necessary for the purpose of discharging materials contained in the process, the further build-up of which would cause concentrations or amounts exceeding limits established by best engineering practice. A report showing how conformance with this requirement will be met, including operational procedures, shall be submitted during the system design stage. Additionally, annual reports on cooling tower operation shall be submitted showing compliance with this requirement. Such reports shall be submitted along with the first quarterly monitoring report submitted after January 1st of each year. Discharge temperature shall not exceed the lowest temperature of the recirculating cooling water prior to the addition of make-up.

T-3

Blowdown shall contain no detectable amount of materials added for corrosion inhibition including, but not limited to, zinc, chromium, and phosphorus.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/week.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): discharge from the combined cooling tower discharge prior to entry into the Ohio River, except that flow measurements shall be provided for each tower separately.

CONTINUED

DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 002 (continued) - Cooling tower blowdown

T-4

1/ The receiving water shall not exceed (1) a maximum water temperature change of 2.8°C(5.0°F) relative to an upstream control point and (2) the maximum temperatures by month noted below, outside of a mixing zone which shall not exceed (1) a maximum width of 100 feet nor (2) a 150-foot linear downstream length.

Jan.	10.0(50)	April	21.1(70)	July	31.7(89)	Oct.	25.6(78)
Feb.	10.0(50)	May	26.7(80)	Aug.	31.7(89)	Nov.	21.1(70)
Mar.	15.6(60)	June	30.5(87)	Sept.	30.5(87)	Dec.	13.9(57)

2/ During the first two-month period of substantially full power operation, analyses shall follow each application of chlorine until sufficient operating experience has been obtained to assure conformance with limitations and then analysis frequency may be reduced to one day per week.

DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 003 - Intake screen backwash (Units 1 through 4)

Such discharges shall be limited and monitored by the permittee as specified below:

Intake screen backwash may be discharged without limitation or monitoring requirements. However, material removed from the bar racks by mechanical equipment shall not be returned to the Ohio River and shall be disposed of in an environmentally acceptable manner.

DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 004 - Point source(s) runoff from stabilized scrubber sludge to Corn Creek

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations	Monitoring Requirements	
	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow-m3/Day (MGD)	N/A	1/week	Grab
Total Suspended Solids (mg/1)	50 1/	1/week	Grab
Additional Monitoring (See Part III.K.)	N/A	1/month	Grab

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/week on a grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): point(s) of discharge from the runoff holding pond prior to mixing with uncontaminated stormwater runoff.

1/ Applicable to any flow up to the flow resulting from a 24-hour rainfall event with a probable recurrance interval of once in ten years. If an impoundment is utilized by permittee, it shall be capable of containing a 10-year, 24-hour rainfall event.

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A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 005 1/ - Point source(s) runoff from material storage to construction runoff pond (001)

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations	Monitoring Requirements	
	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow—m3/Day (MGD)	N/A	1/week	Grab
Total Suspended Solids (mg/1)	50 2/	1/week	Grab
Additional Monitoring (See Part III. L.)	N/A	1/month	Grab

Material storage runoff shall include rainfall runoff to navigable waters through any discernible, confined and/or discrete conveyance from or through any coal, ash or other material storage pile.

T-7

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Point(s) of discharge from the material storage runoff treatment pond prior to entry into construction runoff treatment pond.

1/ Serial number assigned for identification and monitoring purposes.

2/ Applicable to any flow up to the flow resulting from a 24-hour rainfall event with a probable recurrance interval of once in ten years. If an impoundment is utilized by permittee, it shall be capable of containing a 10-year, 24-hour rainfall event.

DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 006 1/ - Construction sewage treatment effluent (two units in parallel will ultimately be provided)
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (mg/1)			
	Daily Avg	7-Day Average	Daily Avg	7-Day Average	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	N/A	N/A	45.4(0.012)		5/week 2/	Grab
BOD 5	1.4(3.0) 3/	2.0(4.5) 3/	30	45	2/month 2/	Grab 4/
Total Suspended Solids	1.4(3.0) 3/	2.0(4.5) 3/	30	45	2/month 2/	Grab 4/
Settleable Solids (ml/1)	N/A	N/A	1.0	1.0	5/week	Grab
Dissolved Oxygen	N/A	N/A	See Below		1/week 2/	Grab
Chlorine Residual	N/A	N/A	N/A	N/A	5/week	Grab
Fecal Coliform 5/ (organisms/100 ml)	N/A	N/A	200	400	1/quarter	Grab

T-8 In addition to the specified limits, the daily average effluent BOD_5 and suspended solids concentration shall not exceed 15 percent of the respective daily average influent concentrations.

Effluent shall contain a minimum of 2.0 mg/l of dissolved oxygen at all times. This limit shall not be applicable subsequent to rerouting of effluent to bottom ash pond.

Prior to commercial operation of Unit 1, this waste stream may be directed to the runoff treatment pond (Discharge serial No. 001) after treatment in the sewage treatment plant. Subsequently, effluent shall be routed to the bottom ash pond.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):
Combined sewage treatment plant effluent prior to mixng with any other waste stream.

1/ Serial number assigned for identification and monitoring purposes.
2/ Subsequent to rerouting of this waste stream to the bottom ash pond the measurement frequency may be reduced as follows: flow - 1/week, BOD_5 - 1/month, Total Suspended Solids - 1/month and Dissolved Oxygen - eliminated.

3/ During periods when only one 6,000 gpd unit is in use, limitations shall be one-half of value shown.
4/ Influent and effluent.

DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 007 1/ - Operational sewage treatment plant effluent discharged to bottom ash pond.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (mg/1)			
	Daily Avg	7-Day Average	Daily Avg	7-Day Average	Measurement Frequency	Sample Type
Flow—m^3/Day (MGD)	N/A	N/A	39.7(0.0105)		1/week	Grab
BOD 5	1.2(2.6)	1.79(3.9)	30	45	1/month	Grab 2/
Total Suspended Solids	1.2(2.6)	1.79(3.9)	30	45	1/month	Grab 2/
Settleable Solids (ml/1)	N/A	N/A	1.0	1.0	5/week	Grab
Chlorine Residual	N/A	N/A	N/A	N/A	5/week	Grab
Fecal Coliform 3/ (organisms/100 ml)	N/A	N/A	200	400	1/quarter	Grab

In addition to the specified limits, the daily average effluent BOD$_5$ and suspended solids concentration shall not exceed 15 percent of the respective daily average influent concentrations.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Sewage treatment plant effluent prior to mixing with any other waste stream.

1/ Serial number assigned for identification and monitoring purposes.
2/ Influent and effluent
3/ Geometric mean.

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A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on commercial operation date of Unit 1 and lasting through expiration the permittee shall monitor as specified below serial number(s) 008 1/ - Plant Intake

Effluent Characteristic	Discharge Limitations	Monitoring Requirements	
	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	N/A	Continuous	Pump logs
Temperature °C(°F)	N/A	Continuous	Recorder
Additional Monitoring (See Part III.L.)	N/A	1/month	Grab

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Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Plant intake.

1/ Serial number assigned for identification and monitoring purposes.

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B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:
   a. Errosion and sediment control reports (III.G.)
      (1) First report - 4 months after start of construction
      (2) Second through fourth reports - quarterly after first report
      (3) Subsequent reports - annually after fourth report
   b. Groundwater monitoring reports (III.H.) - quarterly with annual summary
   c. PCB report (III.B.) - 180 days prior to receipt of PCB containing equipment
   d. 316(b) study (III.D.)
      (1) Study plan - one year prior to commercial operation date of Unit 1
      (2) Start Unit 1 study - 3 months after commercial on-line date of Unit 1
      (3) Report Unit 1 - 18 months after commercial on-line date of Unit 1
      (4) Start Units 1 & 2 study - 3 months after commercial on-line date of Unit 2
      (5) Report Units 1 & 2 - 18 months after commercial on-line date of Unit 2
      (6) Start Units 1 - 3 study - 3 months after commercial on-line date of Unit 3
      (7) Report Units 1 - 3 - 18 months after commercial on-line date of Unit 3
      (8) Start Units 1 - 4 study - 3 months after commercial on-line date of Unit 4
      (9) Report Units 1 - 4 - 18 months after commercial on-line date of Unit 4
   e. Ravine discharge monitoring (III.K.)
      (1) Proposal - 180 days prior to commercial operation date
      (2) Implement - commercial operation date
   f. Blowdown report (002) - annually with first quarterly monitoring report
   g. Chlorine procedures and usage report (002)-annually with first quarterly monitoring report
   h. Condenser tube report (III.J.) - annually after commercial operation date
2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

Note: Any construction of new waste treatment facilities or alterations to existing waste treatment facilities will require a permit or authorization for construction in accordance with applicable state law and regulations.

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C. MONITORING AND REPORTING

1. *Representative Sampling*

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. *Reporting*

Monitoring results obtained during the previous 3 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on . Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

Chief, Water Enforcement Branch
Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

AND

Dept. for Natural Resources an
Environmental Protection
Capitol Plaza Tower
Sixth Floor
Frankfort, Kentucky 40601

3. *Definitions*

a. The "daily average" concentration means the arithmetic average (weighted by flow) of all the daily determinations of concentration made during a calendar month. Daily determinations of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the daily determination of concentration shall be the arithmetic average (weighted by flow) of all the samples collected during that calendar day.

b. The "daily maximum" concentration means the daily determination of concentration for any calendar day.

c. "Weighted by flow" means the summation of each sample concentration times its respective flow in convenient units divided by the summation of the flow values.

d. "Nekton" means free swimming aquatic animals whether of freshwater or marine origin.

e. For the purpose of this permit, a calendar day is defined as any continuo 24-hour period.

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f. The "daily average" discharge means the total discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, the daily average discharge shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.

g. The "daily maximum" discharge means the total discharge by weight during any calendar day.

4. *Test Procedures*

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. *Recording of Results*

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses;

d. The analytical techniques or methods used; and

e. The results of all required analyses.

6. *Additional Monitoring by Permittee*

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. *Records Retention*

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

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A. MANAGEMENT REQUIREMENTS

1. *Change in Discharge*

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. *Noncompliance Notification*

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

a. A description of the discharge and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. *Facilities Operation*

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. *Adverse Impact*

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. *Bypassing*

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Regional Administrator and the State in writing of each such diversion or bypass.

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6. *Removed Substances*

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. *Power Failures*

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I,

b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. *Right of Entry*

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. *Transfer of Ownership or Control*

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. *Availability of Reports*

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public

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inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. *Permit Modification*

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. *Toxic Pollutants*

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. *Civil and Criminal Liability*

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. *Oil and Hazardous Substance Liability*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. *State Laws*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

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9. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected hereby.

PART III

OTHER REQUIREMENTS

A. If the permittee, after monitoring for at least 12 months, determines that he is consistently meeting the effluent limits contained herein, the permittee may request of the Director, Enforcement Division, that the monitoring requirements be reduced to a lesser frequency or be eliminated.

B. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid. In the event that PCB containing equipment is used on site, administrative procedures shall be instituted to (1) maintain a detailed inventory of PCB use, (2) assure engineering design and construction to preclude release of PCB's to the environment, and (3) effectively detect the loss of PCB's from equipment. Detail of such procedures shall be submitted no later than 180 days prior to receipt of PCB containing equipment.

C. The company shall notify the Director, Enforcement Division in writing not later than sixty (60) days prior to instituting use of any additional biocide or chemical used in cooling systems, other than chlorine, which may be toxic to aquatic life other than those previously reported to the Environmental Protection Agency. Such notification shall include:

1. name and general composition of biocide or chemical,
2. 96-hour median tolerance limit data for organisms representative of the biota of the waterway into which the discharge shall occur,
3. quantities to be used,
4. frequencies of use,
5. proposed discharge concentrations, and
6. EPA registration number, if applicable.

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D. In accordance with Section 316(b) of the Act, by three months after the commercial operation date of Unit 1, the permittee shall implement an approved program to monitor nekton and shellfish impinged on plant intake structures and fish eggs and larvae and other organisms entrained by the cooling water system. Additionally, studies shall be conducted for two, three and four unit operation for one year following the commercial operation date of each successive unit. Study plans shall be submitted to the Director, Enforcement Division for approval not later than one year prior to the commercial operational date of Unit 1. Note: Study requirements for Units 2, 3 and 4 may be modified, reduced or eliminated consistant with results obtained from previous units.

By 18 months after commercial operation dates of each unit, the permittee shall submit a summary report to the Director, Enforcement Division and State Director as to the effects of the cooling water intake with regard to Section 316(b) of the Act. If significant impingement and/or entrainment is occurring, this report shall include:

1. An evaluation of facility or procedure modifications, if necessary, to minimize the environmental impact of the cooling water intake,
2. An evaluation of methods to return viable nekton and shellfish collected on the intake screens to ambient temperature water at a point outside the influence of the plant intake and discharge, and
3. Proposed facilities or modifications with attendant implementation schedule(s) for implementing 1 and/or 2 above.

At the conclusion of this study period, subject to opportunity for hearing and review, the permittee shall implement procedures and or facility construction associated with the intake structure(s) if significant impingement or entrainment occur.

E. Effluent discharge structure(s) for outfall serial number 002 shall be designed to assure a minimum dilution factor of 20 for all plant discharge and river flow conditions. Subsequent to commercial operation of each unit, field measurements (supplemented as necessary with modeling results) shall be conducted to assure conformance with this requirement and to determine three-dimensional configuration(s) of the thermal and chlorine plumes. A report showing compliance with the assigned mixing zone shall be submitted by one year after the commercial operation date for each unit.

F. All plant waste discharges not specifically allowed under this Authorization to Discharge including, but not necessarily limited to, ash transport water, boiler blowdown, metal cleaning wastes and low volume wastes (as defined in 40 CFR Part 423) shall not be released to any waste stream which discharges to Waters of the United States.

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G. The permittee shall implement the Erosion and Sedimentation Control Plan approved by the Director, Enforcement Division on ______________. A monitoring report shall be submitted quarterly during the first year of construction and annually thereafter. The report shall be submitted within one month after completion of the monitoring period, with the first report due four months after start of site construction. Modification of the Erosion and Sedimentation Control Plan requires the prior written approval of the Director, Enforcement Division.

H. The permittee shall implement the Groundwater Monitoring Plan approved by the Director, Enforcement Division on ____________. The permittee shall monitor monthly using EPA approved methods to determine the following constituents in the groundwater downgradient of the bottom ash pond, emergency fly ash and sludge storage pond, coal storage areas and sludge disposal areas (Ravines RA and RB): copper, iron, lead, mercury, nickel, selenium, sulfide, sulfate, chloride, total suspended solids, and total dissolved solids. If the quarterly reports demonstrate significant increases (as determined by the Director, Enforcement Division) in contamination of groundwater, the permittee shall implement measures acceptable to the Director, Enforcement Division to control this contamination. Such measures may include but are not limited to: sealing, relocating, or alternate location of the ash pond, coal storage, and other waste disposal areas. If the quarterly reports demonstrate no significant increasing contamination, the permittee, after consultation and with the approval of the Director, Enforcement Division may reduce or eliminate the monitoring program.

In the event the permittee proposes to use new areas for coal storage or ash sludge disposal, the Director, Enforcement Division may require additional monitoring comparable to the above-described plan.

I. No herbicides shall be used prior to initial mechanical clearing of the Clark County, Indiana transmission line and on the Middletown line tie-in. Maintenance use of herbicides shall be limited to EPA registered products used solely on potential "conflict" arboristic species and in strict accordance with the labeled instructions governing their usage.

J. The permittee shall provide a technical study that determines the corrosion/erosion rate of condenser tubes during facility operation to assure protection of aquatic organisms. A study plan shall be submitted not later than one year prior to the commercial operation of Unit 1. Annual reports of study results shall be submitted starting one year after commercial operation date of Unit 1.

K. Not less than 180 days prior to commercial operation of Unit 1, the permittee shall submit a proposal for monitoring the characteristics and effects of runoff from stabilized scrubber sludge from Ravines A and B to Corn Creek and shall implement an approved study by the commercial operation date of Unit 1. Monitoring shall include ravine discharge characteristics as well as upstream and downstream monitoring of chemical parameters and biological impact. Details of the program shall be developed based on characteristics of ongoing research on scrubber sludge stabilization being conducted by the permittee and others.

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L. Additional monitoring of the cooling tower blowdown (002), material storage runoff (005), and plant intake (008) shall be conducted at a frequency of once per month to assure conformance with applicable water quality standards. Parameters shall include ammonia; chloride; nitrate; sulfate; total alkalinity; total hardness; total phosphorus; total, dissolved, settleable and suspended solids; and total aluminum, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, and zinc. After monitoring for a period of 12 months, the permittee may request of the Director, Enforcement Division that the monitoring requirements be reduced to a lesser frequency or be eliminated.

M. In accordance with Section 306(d) of the Federal Water Pollution Control Act (PL92-500) the standards of performance for conventional pollutants as contained in this permit shall not be made any more stringent during a ten year period beginning on the date of completion of such construction or during the period of depreciation or amortization of such facility for the purposes of Section 167 or 169 (or both) of the Internal Revenue Code of 1954, whichever period ends first. The provisions of Section 306(d) do not limit the authority of the Environmental Protection Agency to modify the permit to require compliance with a toxic effluent limitation promulgated under BAT or toxic pollutant standard established under Section 307(a) of the FWPCA, or to modify, as necessary, to assure compliance with any applicable State Water Quality Standard.

EROSION AND SEDIMENT CONTROL PLAN

Prepared by

the Louisville Gas and Electric Company

for

the United States Environmental Protection Agency

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EROSION AND SEDIMENT CONTROL

The proposed erosion and sediment control plan is indicated on drawing 317296-SKS82. The first facility to be constructed will be the sediment retention basin (See Section 4.3.3). The sediment retention basin will contain a discharge structure as shown on drawing 317296-SKS115. Fill for the dike surrounding the sediment retention basin will be taken from the bottom ash storage pond area. The outer slopes of the sediment retention basin will be riprapped immediately after construction.

Top soil stripped from the site will be used for constructing the aesthetic berm at the south end of the property and will be used for establishing ground cover at other areas. Stripping of top soil will be undertaken only as required for construction. Top soil will be stockpiled temporarily as shown on the Erosion and Sediment Control Plan drawing 317296-SKS115. Another stockpile for clay, which will be used for lining the ash and sludge storage ponds, will be located near the stockpiled top soil. Perimeter ditches will surround these stockpiled areas and the runoff will be directed to the sediment retention basin via one of the three major open channels which will traverse the site in the east-west direction.

EROSION AND SEDIMENT CONTROL (cont.)

The major earthwork activity will be the construction of the emergency flyash and sludge storage pond and the bottom ash pond. As the dikes surrounding these areas are being constructed, seeding and mulching of the exterior slopes will be carried on concurrently. The interior slopes would not be protected since it will be necessary to regrade and line the slopes with clay after the dikes are constructed. During the fill operation the top surface of the dikes will be sloped toward the inner slope. This procedure will allow most of the runoff to accumulate inside the diked area. Any excess accumulation of water inside the diked area, which would hamper construction, would be pumped from the ponds and diverted to the sediment retention basin.

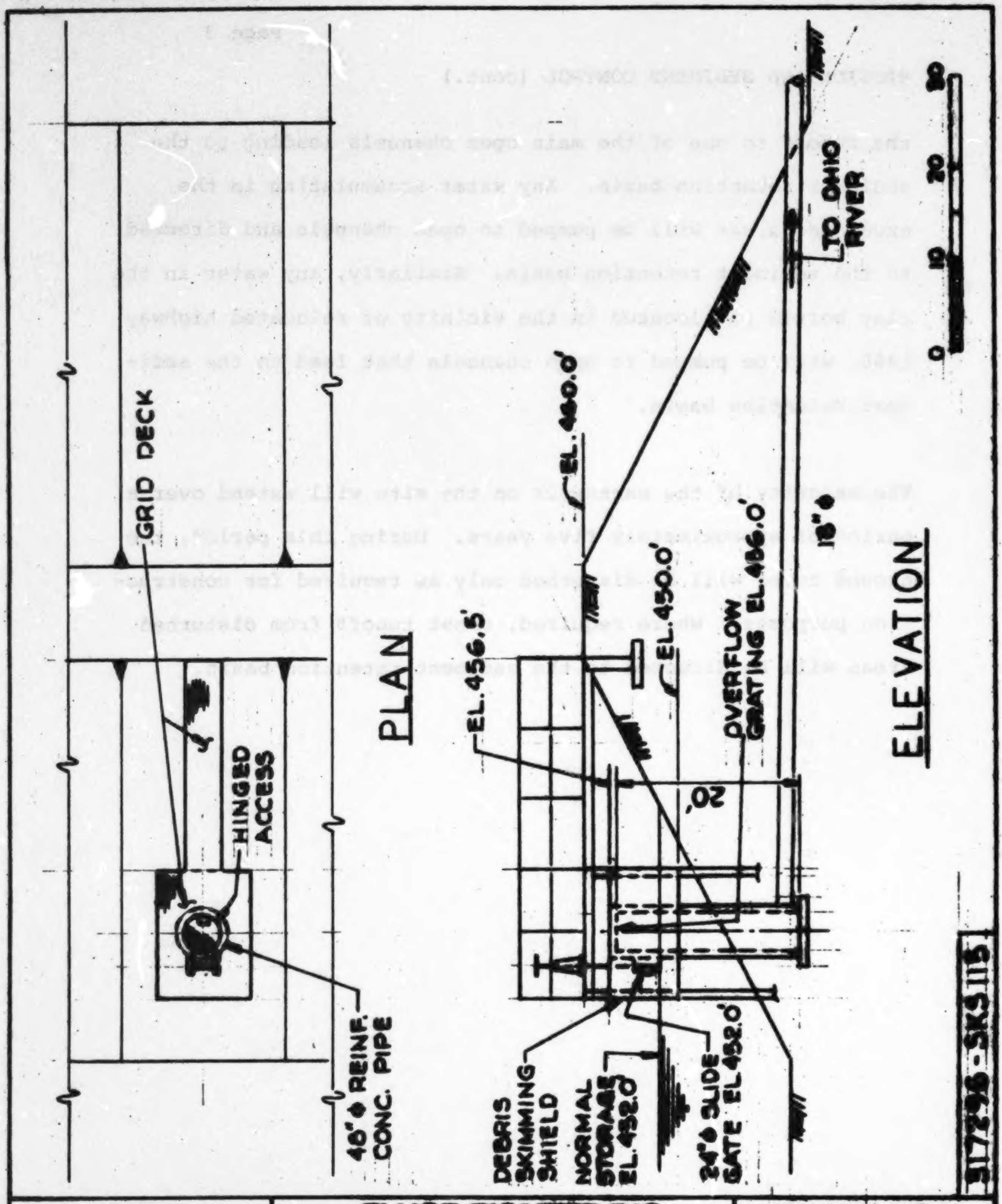
The construction of relocated highway 1488 will require cut and fill operations along the eastern portion of the site. Runoff in this area will be diverted to relocated Corn Creek at the northern edge of the site and to Barebone Creek at the south. The graded areas within the right-of-way will be seeded and mulched immediately after construction.

Approximately fifteen feet of soil must be removed at the location of main plant structures. The excavation would then be filled with compacted granular soil to the bottom of the foundations. Stockpiled soil in this area would be surrounded with perimeter ditches or hay bale diversion dikes which will direct

EROSION AND SEDIMENT CONTROL (cont.)

the runoff to one of the main open channels leading to the sediment retention basin. Any water accumulating in the excavated areas will be pumped to open channels and directed to the sediment retention basin. Similarly, any water in the clay borrow pit located in the vicinity of relocated highway 1488, will be pumped to open channels that lead to the sediment retention basin.

The majority of the earthwork on the site will extend over a period of approximately five years. During this period, the ground cover will be disturbed only as required for construction purposes. Where required, sheet runoff from disturbed areas will be directed to the sediment retention basin.


GRID DECK
HINGED ACCESS
48"ϕ REINF. CONC. PIPE
PLAN
EL. 460.0'
EL. 456.5'
EL 450.0'
OVERFLOW GRATING EL 456.0'
18"ϕ
20'
TO OHIO RIVER
0
10
20
30
DEBRIS SKIMMING SHIELD
NORMAL STORAGE EL 452.0'
24"ϕ SLIDE GATE EL 452.0'
ELEVATION
31-7296-SKS1115

DATE	**FLUOR PIONEER INC.**	**STANDARD DETAIL**
	LOUISVILLE GAS & ELECTRIC COMPANY TRIMBLE COUNTY PLANT SITE	SHT
PROJ. 31-7296	SEDIMENT RETENTION BASIN DISCHARGE STRUTURE	

FORM G-312 11/1/74

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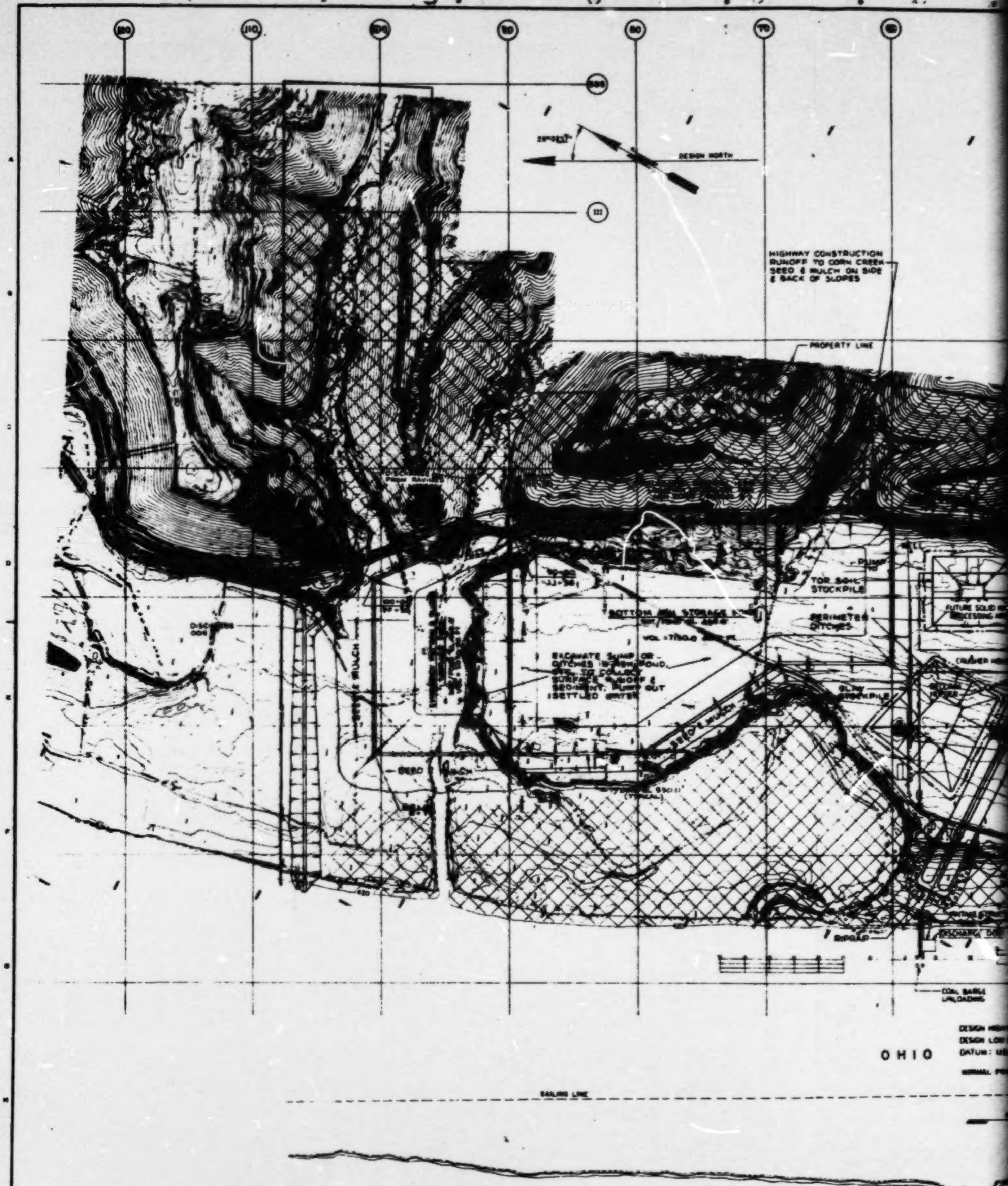

120
110
100
90
80
70
60
DESIGN NORTH
HIGHWAY CONSTRUCTION RUNOFF TO CORN CREEK SEED & MULCH ON SIDE & BACK OF SLOPES
PROPERTY LINE
PUMP
TOP SOIL STOCKPILE
BOTTOM ASH STORAGE
VOL.
PERIMETER DITCHES
EXCAVATE SUMP OR DITCHES IN ASH POND TO COLLECT SURFACE RUNOFF & SEDIMENT, PUMP OUT SETTLED WATER
SEED & MULCH
CLAY STOCKPILE
FUTURE SOLID PROCESSING
SEED
MULCH
DISCHARGE
RIPRAP
DISCHARGE
COAL BARGE UNLOADING
OHIO
DESIGN
DESIGN LOW
DATUM :
NORMAL
SAILING LINE

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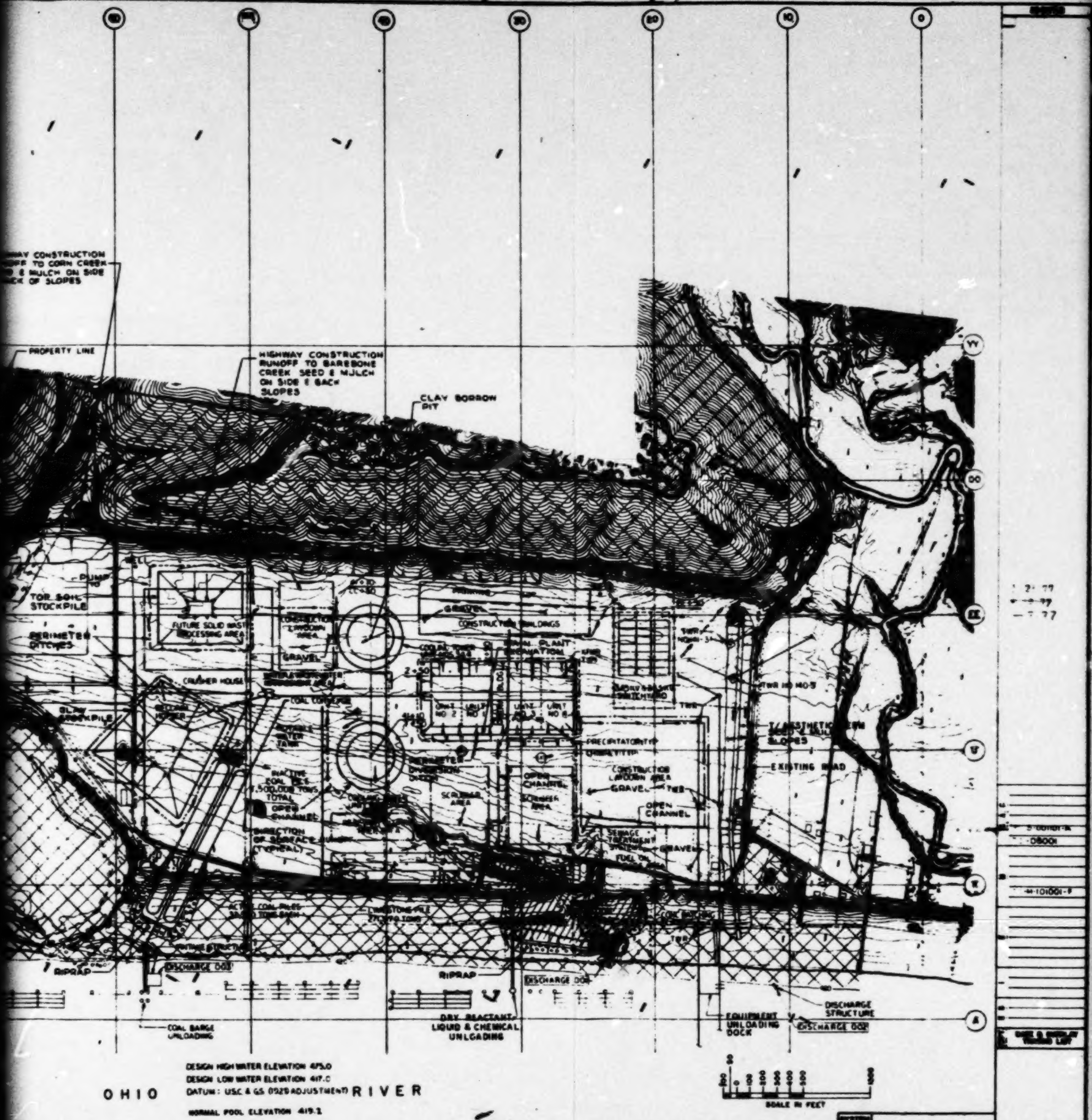


WAY CONSTRUCTION
NOFF TO CORN CREEK
D & MULCH ON SIDE
CK OF SLOPES
PROPERTY LINE
HIGHWAY CONSTRUCTION RUNOFF TO BARBBONE CREEK SEED & MULCH ON SIDE & BACK SLOPES
CLAY BORROW PIT
PUMP
TOP SOIL STOCKPILE
PERIMETER DITCHES
FUTURE SOLID WASTE PROCESSING AREA
GRAVEL
CONSTRUCTION BUILDINGS
CRUSHER HOUSE
COAL CONVEYOR
CLAY STOCKPILE
INACTIVE COAL PILE 1,500,000 TONS TOTAL
OPEN CHANNEL
DIRECTION OF SURFACE DRAINAGE (TYPICAL)
PERIMETER DIVERSION DITCH
SCRUBBER AREA
UNIT NO 2
UNIT NO 1
UNIT NO 3
UNIT NO 4
PRECIPITATOR
CONSTRUCTION LAGOON AREA
SEWAGE TREATMENT
FUEL OIL
TWR NO 3
EXISTING ROAD
ACTIVE COAL PILES
LIMESTONE PILE
COAL BARGING
RIPRAP
DISCHARGE 003
DISCHARGE 001
DISCHARGE 002
DISCHARGE STRUCTURE
COAL BARGE UNLOADING
DRY REACTANT LIQUID & CHEMICAL UNLOADING
EQUIPMENT UNLOADING DOCK
YY
OO
EE
U
X
A
OHIO RIVER
FLOW
SCALE IN FEET

DESIGN HIGH WATER ELEVATION 475.0
DESIGN LOW WATER ELEVATION 417.0
DATUM: USC & GS (1929 ADJUSTMENT)

NORMAL POOL ELEVATION 419.1

NOTE:

KENTUCKY PLANE COORDINATES (NORTH ZONE)

$\frac{N00,000}{E00,000} = \frac{48+53.356}{L+17.984}$ STATION COORDINATES

▨ INDICATES AREA WHERE VEGETATION WILL NOT BE REMOVED

NOTE:-
- SEED AND MULCH OTHER AREAS EXPOSED FOR LONG PERIODS OF TIME

SEAL

LOUISVILLE GAS & ELECTRIC COMPANY
TRIMBLE COUNTY GENERATING STATION UNIT NO. 1
LOUISVILLE, KY.

EROSION AND SEDIMENT CONTROL PLAN

FLUOR PIONEER INC.

GROUND WATER MONITORING PROGRAM

Prepared by

the Louisville Gas and Electric Company

for

the United States Environmental Protection Agency

u-i

APPENDIX U

GROUND WATER MONITORING PROGRAM

The applicant will implement a ground water monitoring program, as required by EPA, to detect escape of pollutants from waste ponds, waste storage areas, and coal storage areas at the Trimble County site. Monitoring of water wells during construction of the plant will develop a 5 to 8-year data base. This baseline data will help indicate any change in the range of constituents in the ground water after the plant is operational. Monitoring of the ground water will be performed quarterly during construction and monthly during operation of the plant. Quarterly reports will be submitted to the EPA and the Commonwealth of Kentucky. Applicable EPA-approved methods, as outlined in Methods for Chemical Analysis of Water and Wastes (EPA, 1976), will be used to determine, within limits of detection, various constituents of ground water. The various constituents to be analyzed are discussed in the following paragraphs.

Monitoring of three wells during the construction period on a regular basis will establish baseline data to help determine and identify possible existing pollutants. Prior to major construction activities on the site, a contractor will put in two wells for use during construction. These wells will be utilized for establishing baseline ground water conditions. After installation of the two wells, standing water levels will be measured in each well and a set of water samples will be collected. This sampling will be accomplished by pumping the wells for 1 hour at 10 gpm or at least until 500 gallons are removed so that the water entering the well is from the aquifer and not contaminated from the installation of the well itself. The water samples will then be analyzed using approved EPA procedures. The initial samples of the ground water from each well will undergo a complete background analysis. The initial parameters in the background analysis to be measured will include: silica, iron, manganese, calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, fluoride, nitrate, total dissolved solids, hardness as $CaCO_3$ and non-carbonate, specific conductance, pH, copper, lead, mercury, nickel, and selenium. Other constituents, if deemed necessary by EPA, will be analyzed in accordance to the same standards.

The third well (No. 9 on Figure 5.3.2-2) is presently used for domestic purposes and will also be monitored for the same constituents as above. This domestic well, drilled 100 feet into alluvium and adjacent to the site, will be sampled to establish any potential off-site contamination.

After the initial background analysis is performed and interpreted, quarterly monitoring of the three wells will be initiated. Grab water samples from each well will be analyzed by a laboratory for at least the following constituents: copper, iron, lead, mercury, nickel, selenium, sulfate, total dissolved solids, specific conductance and pH. The analytical procedures approved by EPA will be followed. If unexpected variations or fluctuations in the quarterly analyses are found, monthly monitoring of the three wells may be implemented.

Operational monitoring will be conducted on the one off-site well (No. 9 on Figure 5.3.2-2) and six on-site wells having the general locations presented on

Figure 7.6-1. If the two wells, which are to be used to supply water for construction activities, generally correspond to the above locations, they would serve as two of the six wells designated for operational monitoring. Otherwise, six additional wells would be drilled down gradient of the on-site bottom ash, emergency fly ash and scrubber sludge disposal pond, as well as coal storage areas. The drilling of these wells will be supervised by a geological engineer who will detail the proper elevation for placement of the well-screen. The expected elevation for the bottom of each well is 410 feet above sea level. An assessment will be made as to whether a permeable zone exists at each well at this bottom elevation. Adjustments on the placement of screens in each well will be made accordingly.

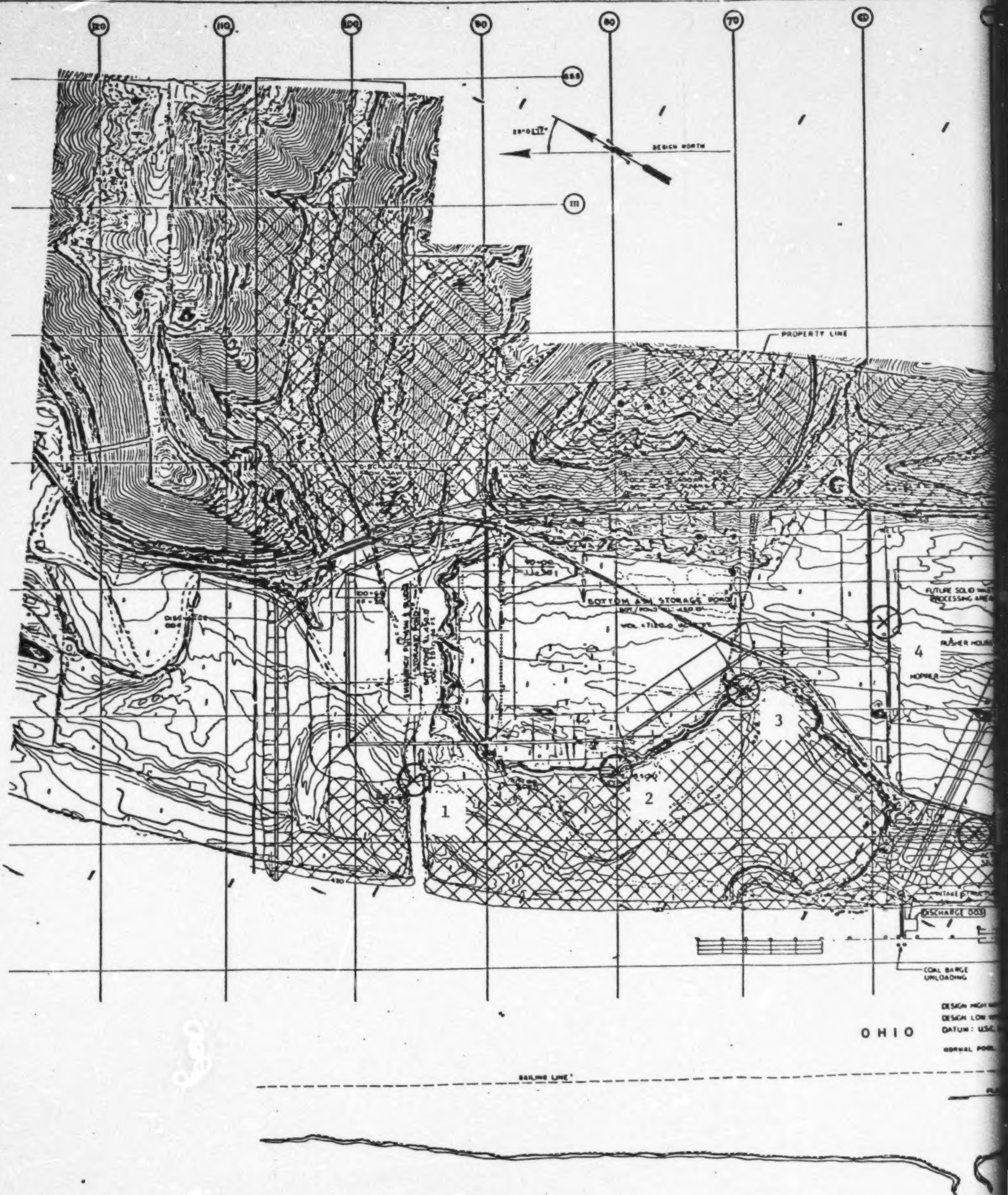
After proper completion of each well a) water levels will be measured; b) each well will be pumped to remove stagnate water contained in the well (approximately 200 gallons); and c) water samples will be collected to be analyzed according to EPA standard methods. The initial set of samples for all of the wells will be analyzed for the following constituents: silica, iron, manganese, calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, floride, nitrate, total dissolved solids, hardness as $CaCO_3$ and non-carbonate, specific conductance, pH, copper, lead, mercury, nickel, and selenium.

On a monthly basis, thereafter, water levels will be measured in each well; each well will be pumped for a period of time and water samples collected for analysis. The analysis will include, copper, iron, lead, mercury, nickel, selenium, sulfate, total dissolved solids, specific conductance and pH. In addition, well Number 6, down gradient of the fuel storage area, will be monitored for hydrocarbons, grease and oil to delete any possible spill of the fuel.

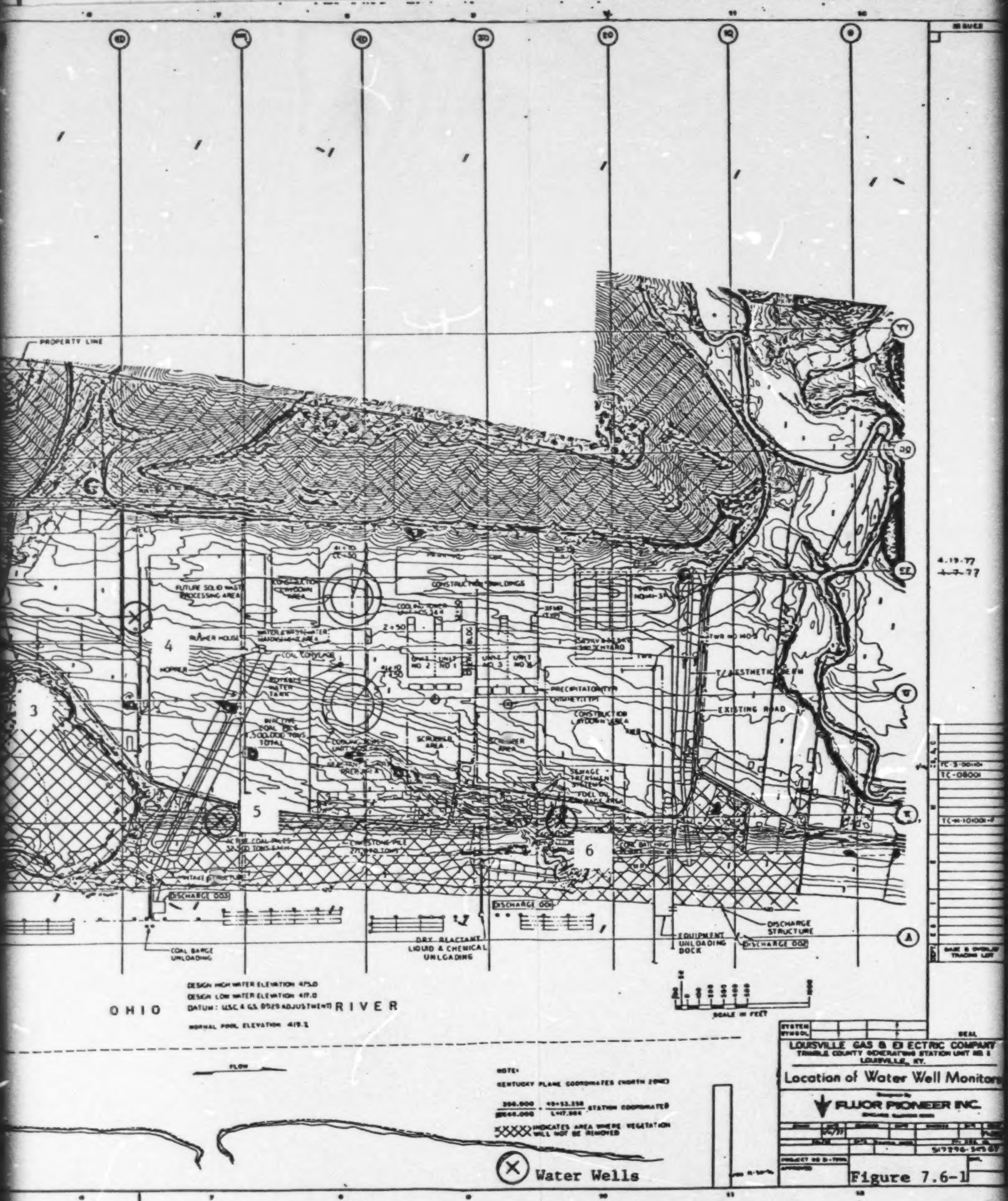
The EPA will be informed of any proposed changes to the monitoring program. The EPA may require additional monitoring, if warranted, following the placement of additional units on the site or following the initiation of use of new areas for coal storage, ash or sludge disposal ponds. If leachate is suspected, ground water monitoring in the ravines may be required.

Should the monthly reports demonstrate significant contamination of ground water, the Applicant will implement measures to mitigate such contamination to assure that no future contamination will occur. Those measures acceptable to EPA may include but not be limited to: sealing, relocating, or altering operations of the ash or sludge disposal ponds and/or coal storage area.

After monitoring for a period of 12 months after commercial operation of Unit #1, no significant contamination of ground water is found, the permittee may request of the Regional Administrator that the monitoring requirements be reduced to a lessor frequency or be eliminated.


120
110
100
90
80
70
60
555
111
DESIGN NORTH
PROPERTY LINE
BOTTOM ASH STORAGE POND
VOL. =1120.0 AC-FT
FUTURE SOLID WASTE PROCESSING AREA
WASHER HOUSE
HOPPER
1
2
3
4
INTAKE STRUCTURE
DISCHARGE 003
COAL BARGE UNLOADING
OHIO
SAILING LINE
DESIGN HIGH W
DESIGN LOW W
DATUM: USC
NORMAL POOL

U-3


PROPERTY LINE
FUTURE SOLID WASTE PROCESSING AREA
CONSTRUCTION LAYDOWN AREA
CONSTRUCTION BUILDINGS
COOLING TOWER UNITS 3 & 4
CRUSHER HOUSE
WATER & WASTEWATER MANAGEMENT AREA
COAL CONVEYOR
HOPPER
POTABLE WATER TANK
INACTIVE COAL PILE 1,500,000 TONS TOTAL
UNIT NO 2
UNIT NO 1
UNIT NO 3
UNIT NO 4
2+50
SERV. BLDG.
COOLING TOWER UNITS 1 & 2
SCRUBBER AREA
SCRUBBER AREA
PRECIPITATOR (TYP)
CHIMNEY (TYP)
CONSTRUCTION LAYDOWN AREA
SWITCHYARD
T/AESTHETIC BERM
EXISTING ROAD
SEWAGE TREATMENT SYSTEMS
FUEL OIL STORAGE AREA
ACTIVE COAL PILES 32,500 TONS EACH
LIMESTONE PILE
INTAKE STRUCTURE
DISCHARGE 003
DISCHARGE 001
DISCHARGE 002
DISCHARGE STRUCTURE
COAL BARGE UNLOADING
DRY REACTANT LIQUID & CHEMICAL UNLOADING
EQUIPMENT UNLOADING DOCK
CONC BATCHING
3
4
5
6
OHIO RIVER
DESIGN HIGH WATER ELEVATION 475.0
DESIGN LOW WATER ELEVATION 417.0
DATUM: USC & GS. 1929 ADJUSTMENT
NORMAL POOL ELEVATION 419.2
FLOW
SCALE IN FEET
NOTE:
KENTUCKY PLANE COORDINATES (NORTH ZONE)
STATION COORDINATES
INDICATES AREA WHERE VEGETATION WILL NOT BE REMOVED
Water Wells
4-19-77
TC-3-00101
TC-0800I
SYSTEM SYMBOL
SEAL
BASE & OVERLAY TRACING LIST
FLUOR PIONEER INC.
PROJECT NO
APPROVED
517296-34567

LOUISVILLE GAS & ELECTRIC COMPANY
TRIMBLE COUNTY GENERATING STATION UNIT NO. 1
LOUISVILLE, KY.

Location of Water Well Monitor

Figure 7.6-1